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BMFT Announces Subsidy Plan for Superconductor Research

3698m076 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 465, 14 Oct 87 p 7

[Text of Federal Ministry for Research and Technology [BMFT] announcement on "the subsidizing of joint projects to explore the technical potential of new superconductors;" issued in Bonn, 23 September 1987]

[Text] 1. The Federal Minister for Research and Technology (BMFT) intends to subsidize research to exploit the technical potential of new superconductors within the framework of research subsidies for superconductor and low temperature technology.

2. The main priorities will be in the following areas:

2.1 Research for the construction of current carrying elements (such as wires, bands, and connecting structures) with selected processes, and optimization of their electrical, mechanical, and other physical and chemical properties including connecting technology;

2.2 Research regarding problems of measuring technology in the field of superconductors.

2.3 Research on new cooling concepts and coolers;

2.4 Research in new areas for superconductor applications;

2.5 Surveys for the evaluation of the technical and commercial impact of superconductor technology.

3. Joint projects must be conducted by companies and research institutes. The project application must indicate clearly the individual contribution of the partners involved. Single projects must be summarized in a main theme, and a coordinated project and financial plan must be presented. A coordinator must be appointed for each joint project.

4. The companies participating in an industrial or commercial collaborative project may apply for a federal subsidy of up to 50 percent of the accountable costs related to the project. For more effective cooperation between companies and their partners in research institutes, companies must provide an additional portion—generally 25 percent—of the expenditures incurred by the institutes. The remaining 75 percent of expenditures incurred by the [research] institutes and up to 50 percent of company related costs will be met by the BMFT.

5. Proposals for implementation of the research referred to above, which first must be presented in [the form of] a short summary of the project (with special attention to the theme of the project, its objectives, a program of work and schedule, financial requirements, and participants) may be sent immediately to the project administrator VDI-Technologiezentrum Physikalische Technologien Graf-Recke-Str.84 4000 Duesseldorf 1 (Att. Dr Gronau, Mrs.) Tel: 02 11/62 14-587

The project administrator will provide further information and organizational advice. Bonn, 23 September 1987 423-7115-16/87

On behalf of the federal minister for research and technology Dr Widdershoven

08617

Initial Achievements of FRG Materials Program Outlined

3698m090 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 466, 26 Oct 87 p 7

[Text] At the presentation of the 1986 annual materials research report, FRG Research Minister, Dr Heinz Riesenhuber, gave a review of the first results of the FRG government's Materials Research Program. The program concentrates on projects conducted on a long-term basis with a high-level of technical, scientific, and financial risk, and aims to improve the competitiveness of companies in [the field of] materials technology. The FRG materials research and industry should be able to hold its ground against international competition and to make better use of its capabilities on the market.

Since the start of the program in October 1985, joint research projects totaling DM650 million have been started. The BMFT participated in these projects with approximately DM360 million.

A comprehensive survey of the joint projects started before the end of 1986 is included in the present 1986 annual report. The survey includes a summary along with technical objectives, work program, and work phase, as well as project partners and costs, for each of the joint projects included among the following program priorities: —high performance ceramics, —powder metallurgy, —high temperature/special materials, —composite materials, —new polymers, and the subsidized field of "friction and wear."

The joint cooperation efforts of industrial research and scientific institutes which directly subsidize the Materials Research Program have already proved to be effective and successful. A more detailed explanation is necessary for the example of the subsidy field "fiber and blade-reinforced ceramics."

High performance ceramic materials are particularly attractive from a technical and industrial viewpoint. They are resistant to high temperatures, are corrosion and wear resistant, and have a relatively low specific

weight. The raw materials required for them are available in practically unlimited quantities and at low prices. Unfortunately, the technical ceramics available today are very brittle, and this leads to reduced resistance to thermal shocks as well as to extreme sensitivity of the material components to blows and shocks.

Until 1985, FRG research and development in this field was carried out systematically and only on a small scale.

Since the start of the Materials Research Program, two important work groups have been formed which, through close cooperation between science and industry, are working to regain a leading position in this field.

For the first group, in which four industries are cooperating with four research institutes, the priority task has become the strengthening of ceramic materials with long fibers.

The second joint project, on which researchers from two companies and two institutes are working together, is examining the possibility of strengthening high performance ceramic materials through the insertion of whiskers, that is, small, monocrystalline ceramic fibers. Both projects are already producing promising results.

08701

AEROSPACE, CIVIL AVIATION

FRG Responds to Green Query on Space Policy

3698m097 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 465, 14 Oct 87 pp 4-5

[Text] The FRG government is of the opinion that the opportunities offered by manned space travel, and by a manned space station in particular, should not be left unexploited. In its reply to an extensive inquiry by the Green Party, the FRG government stated that it subsidizes space travel and space exploration in the firm belief that these are important technology fields that will be decisive in determining future competitiveness.

[The government said that] since space travel programs are supplied on a long term basis, meaningful assessment of future advantages is still impossible at present. For the long term alignment of the FRG space program, the government announced a carefully formulated plan that will take into account both the requirements of the long term European space program—which was only presented in June 1987 by the managing director of the European Space Agency (ESA)—as well as FRG participation in this program, as yet unestablished. The FRG government believes that at the present research stage it is still too early to comment on possible technological breakthroughs [achieved] through research results in space travel. The number of experiments in space carried out to date is still limited. At present the government also refused to comment on possible effects on the FRG labor market of the ARIANE 5 launcher, of the orbital glider HERMES, and FRG participation in the U.S. space station COLUMBUS. However, the government noted that FRG companies have already participated successfully in [the publication of] job announcements within the framework of European and international space research, and in this way they have been able to create and guarantee skilled positions even in structurally weak regions.

The number of jobs specifically related to space activity is not increased by the authorities. However, since 1973 industry has voluntarily advertised jobs for all those employed in both aeronautics and astronautics. Following this, the number of people employed in space travel increased from 2,783 (in 1973) to 5,758 (in 1986). The majority of these were highly skilled positions (for technical college graduates, specialist college graduates, technicians, and experts).

In reply to the Green Party's comments that attempts are being made to make Europe a "space power" of the 21st century, the government said that cooperation between the ESA member states serves exclusively peaceful purposes and European integration. Space projects in which the FRG government takes part are exclusively for civil purposes. However, the Defense Ministry already participates with ground stations in the communications and navigation satellite systems of their allies. In reply to questions concerning possible FRG participation in the HERMES project, the FRG Government [said that] it would deal with the evaluation of the orbital glider together with the decision concerning participation in a development program.

08701

FRG's Riesenhuber Comments on Manned, Unmanned Space Flight

3698m087 Duesseldorf VDI-NACHRICHTEN in German No 42, 16 Oct 87 p 4

[Interview with FRG Research Minister Heinz Riesenhuber by Wolfgang Mock: "Space Technology Gains Political Significance. Europe Needs Researchers in Space. Riesenhuber Expects Effects in New Production Processes;" first paragraph is VDI-N introduction]

[Text] VDI NACHRICHTEN, Bonn, 16 October 1987—Bonn's decision concerning FRG participation in European space programs has been postponed. The European Space Agency's (ESA) projects worth billions of DM have met strong opposition. Many critics fear the money could be withdrawn from other research projects. This is why European consultations about the Hermes and Columbus projects and further development of the Ariane launchers are being dragged out. In an interview with VDI-NACHRICHTEN, Research Minister Riesenhuber outlined his plans for a stronger federal government commitment to aerospace.

[Question]: Minister, how do you justify the FRG's increased commitment to aerospace?

[Answer]: There are many points in favor of the FRG's commitment to space activities, and research is only one of these. Foreign policy, economic policy, and the human thirst for knowledge at a cultural level provide additional reasons for strengthened aerospace commitment. Space technology is an increasingly important aid to security in world disarmament and peace. Therefore, it is also a support for foreign policy.

Space technology exploitation is gaining in importance in policy areas such as development aid, environmental control, and energy policy.

This is why we must develop space technology further, so that its positive effects can really benefit mankind.

Then there is our general aim to extend knowledge through basic research. This is expressed particularly by extraterrestrial research. Telecommunications and our general scientific program are not in question.

Our intensified aerospace program includes not only the fields already mentioned but, in particular, Europe's independent access to manned space travel. In the long run, this should mean taking a new step forward toward the conquest of space.

Man is indispensable for the new phase of products and manufacturing processes and the related experiments in space.

Current use of space is based primarily on the exploitation of quantities of information from space for mankind.

Manned space travel now opens up new perspectives for scientific discoveries concerning new products and manufacturing processes. We must exploit this [opportunity].

[Question]: What economic benefits can we expect from manned space travel? Are cost-benefit calculations appropriate in this case?

[Answer]: The scientist-astronaut has a multiple role. He is a scientist acting in space to guide and develop experimental programs, primarily in the space laboratory. There are still no alternatives to microgravity research. In contrast to the tasks of extraterrestrial research, which is a matter of measurements that can be described exactly in advance, the new scientific research fields deal with fluid physics, material and bioscientific research, and medical research missions, which require continuous on-the-spot expert attention, evaluation and, when necessary, guidance, maintaining contact with scientists on the ground at all times. These remote-controlled interventions in experimental processes cannot as yet be carried out via "telescience" (that is, on-screen guidance of experiments from a ground station), because the necessary expenditures would be too great, and the processes and technology developed so far are still totally inadequate. The experience acquired with D-1 proves that the human presence aboard space vehicles cannot be replaced by any alternative because of man's indisputable powers of observation and judgment.

The scientist-astronaut works in space as an operator and can remove disturbances.

For example, without human interventions, the MEDEA in D-1 payload element, used primarily for tasks in materials research tasks, would not have started up, because a vacuum valve would have caught and 10 experiments would have been lost. The scientist-astronauts were able to effect the repair needed by working in collaboration with an error search program on the ground. The mirror heating equipment in the materials laboratory had problems that could have been removed. We are also virtually at the beginning of developments in technical solutions that have to be used on a trial and error basis during onboard research. If at this point we were to introduce a substantially higher degree of reliability here, it would send development and qualification costs sky-high.

Here, too, the cost of complete automation has no economic relation to installing usable redundancies.

After his missions and when preparing further flights, the astronaut must act as mediator between the "system," with its special demands in terms of functionally correct explanation and reliability, and the users.

The existence of scientist-astronauts can have important reverberations beyond their immediate tasks. The fact that they have taken up these tasks shows their concern for passing on this knowledge as university teachers. This enables them to start preparing students through their experience at an early point in the students' education.There is no proof that manned space travel necessarily has to be much more expensive than unmanned [space travel]. On the one hand, steadily increasing payload costs force even conventional transport systems to ever greater reliability, while on the other hand, to dispense with the use of humans in missions like D-1 would cause drastic increases in automation costs. Furthermore, missions such as D-1, where 75 experiments were carried out in one flight, many with several runs, could only be completed during several flights if they were automated, without the specific, nonautomated observation, control, and decisionmaking functions of the scientists on board being completed. In the development of the Spacelab, the costs of the life support system ran to about 5 percent of overall development costs, but it must be remembered that the laboratory was used for at least 50 flights.

The role of the scientist on board only starts to diminish when the procedures and processes—for example in missions like crystal culture or cell fusion or separation—are understood and mastered for production processes. Only then can their use in space as production processes be automated. But then we must also consider new questions and new uses which give new impulses to research.

[Question]: What are the advantages for medium-sized industries?

[Answer]: This depends primarily on our achieving broad participation by German industry. In this connection, we are on the right path; while only three industrial experiments would have flown on the D-1 mission, today there are already 40 applications for experiments on the D-2 mission, the vast majority from small and medium-sized firms. This shows how interest in space research is growing. The range of main contractors also plays an important role. This strong medium-sized economic area has used its great flexibility in further developing equipment, systems and components to orient itself toward the special requirements of customers. Small and medium-sized enterprises profit from this participation in aerospace projects through further development of their products and activities, with the opportunities they have to expand in the markets that arise as a consequence. This all contributes to ensuring that know-how gained in aerospace technology also finds a broad diffusion.

[Question]: What are the priority scientific interests?

[Answer]: The position of FRG aerospace research among equivalent partners is indisputable: in subspecialties such as solar research, it holds a leading position. Our high participation in the ESA program and in bilateral projects in international projects make this clear. Indeed, half the experiments in the ESA Giotto comet probe, which observed Halley's Comet, were developed by FRG research institutes.

Since 1968, four national/bilateral scientific satellites and two space probes have been successfully launched and operated, with a further 10 satellites in ESRO/ESA.

The most important aerospace research fields in the FRG are astronomy/astrophysics, [including] studies and analyses of galactic and extragalactic objects in all spectral zones. The FRG either participates in or is the prime contractor of projects like the Gamma Ray Observatory (GRO), the infrared laboratory GIRL for spacelab flights, the 1-m-EUV-telescope and INTERZODIAK high-altitude research rocket projects, HIPPARCOS, and the X-ray satellites EXOSAT and ROSAT.

The second field includes the solar-terrestrial relationship, the sun, and the solar system. This involves investigation of charged and uncharged particles, together with magnetic and electric fields in the space between the earth and the sun for the exploration of the magnetosphere and the belt of radiation, as well as the ionosphere and the atmosphere or the earth and interplanetary space. The FRG either participates in or leads projects like the high-altitude research rocket program MAP/WINE and CAESAR, the Aeronomy satellite SAN MARCO D, the magnetosphere program AMPTE and ISEE, the solar proble program HELIOS, and ISPM.

The third and last field is that of planet and comet research, to explore the surface consistency, atmosphere, and ionosphere of planets or the surroundings and core of comets and asteroids. The FRG participates in projects such as Voyager 1 and 2, Pioneer, Venus Mission, the Jupiter probe "Galileo," and the comet probe "Giotto."

According to scientists, much of the additional growth in demand in aerospace research by the beginning of the 1990's can be satisfied through rational exploitation of our current satellite and probe systems. However, there are already a series of proposals for longer term program planning, which require assembly in orbit, the replenishment of consumable goods, readjustments, alterations, and maintenance in space, in order to execute the scientific mission or to improve the cost-benefit relationship. Such operational requirements can be fulfilled with the aid of space stations.

By extending these research tasks with space measurements, either with the "view on the outside" or "on-site" approach, aerospace technology opens up important possibilities [to deepen] our knowledge about the earth.

08702

EUROFAR Convertiplane Detailed

Rome AERONAUTICA E DIFESA in Italian No 13, Nov 87 pp 14-17

[Article by Liberatore Foscolo: "EUROFAR: The European V-22"]

[Text] At the 1985 Paris airshow, one of the new products that aroused a great deal of interest was the Bell XV-15 convertiplane with tilting rotors, the "test bench" for the future Bell/Boeing V-22 Osprey. The concept of an airplane with two rotors located at the end of the wings, able to tip forward through a 90-degree rotation to become propellers permitting translational flight, is not a new one. The advantages are evident when one considers the maximum speed possible (630 km/h, far exceeding the physical limitations of the conventional helicopter). As we said, the concept has been examined since the 1950's, but what was impressive about the XV-15 was its technical reliability—it was not longer just a curiosity, but a fully operational technical product.

The European helicopter industry immediately became interested in this solution. Leading the pack were Agusta and Aerospatiale, firms which had indicated on various

occasions that the tilting rotor was the solution of the future, allowing helicopters to make the quantum leap that had never been possible before. Through a memorandum made public in August 1986, Aerospatiale, Agusta, MBB, Westland, Aeritalia, and CASA announced their intention to build a demonstration model to be financed within the framework of EUREKA, the European technological research program.

The firms involved decided on a 3-year research program for which they asked the EUREKA organization—comprising 19 European nations—for appropriations to cover 75 percent of the program cost, estimated at $45 million.

In fact, research of this kind is not new to European industry. Aerospatiale had already inherited [the earlier research] in this field from Nord Aviation, but the development costs involved dissuaded it from doing research on its own. For this reason, Aerospatiale turned to the firms listed above which, in September 1986 ratified the memorandum of understanding of the previous month. The project was given the name EUROFAR (European Future Advanced Rotorcraft). Agusta chairman Teti displayed a small model on 12 January this year at the first public dynamic-bench test of the EH-101 [European Helicopter]. The firms involved plan to implement the 3-year program between June 1987 and June 1990.

The ministers of the governments involved in the EUREKA program were initially unenthusiastic about the project. In fact, the Stockholm meeting of 17 December 1986 was inconclusive, and matters were postponed until the following meeting, held in September of this year. In any case, the six firms involved are going ahead with the EUROFAR project and expect to have a flight demonstration model in 1991-2 if the necessary funding can be obtained.

From a technical viewpoint, the participants in the EUROFAR program have been extremely tightfisted with information and drawings. However, it is known that the objective is to produce an aircraft for civilian use to carry 19 passengers for distances of 1,000 km at a cruising speed of 580 km/hr. The airplane looks like a scaled-down version of the AIR-42, with rectangular wings that have two RTM-322-11 turbines at the tip, and with three-blade rotors/propellers 10 meters in diameter. The tare weight is expected to be 6 tons with a 4-ton payload. Maximum weight for VTO (vertical take off) will be 10 tons, which may increase to 13 tons for STO (short take off).

In this case, the payload would be 6,785 kg. Maximum operating altitude will be 7,500 meters and transfer autonomy for short take off is 5,959 km. Kerosene consumption is estimated to be 1.2 kg per km. The EUROFAR group states that costs for this kind of convertiplane will be 1.15 times those of a conventional helicopter of equal capacity, with an hourly cost equal to 84 percent, and a cost per Kilometer equal to 42 percent [of a conventional helicopter's costs].

It is clear that, with a program which is so new, there are a number of unknown factors. To a great extent, EUROFAR's future will depend on evaluations of the V-22 and the Sikorsky S-72X-1 "X-wing." The latter is a demonstration model for a different technological concept, namely the X-wing. If the V-22 formula works, the path to EUROFAR will also be secure. If, on the other hand, the X-wing is successful (or more successful), then Europe will have another challenge to face.

08615

COMPUTERS

Suprenum Computer Prototype Unveiled at Bonn Conference

3698m086 Duesseldorf, VDI NACHRICHTEN in German No 42, 16 Oct 87 p 37

[Text] VDI-NACHRICHTEN, Bonn, 16 November 1987—The FRG's Suprenum supercomputer has passed its first test run successfully. The Suprenum corporation showed a functional prototype of its digital supercomputer Suprenum 1 for the first time in public at the "2nd International Suprenum Workshop" in Bonn. Experts estimate that the Suprenum project places the FRG in the lead in international projects in super computers.

Fourteen partners from large scale research institutes, university, and industry participating in developing the FRG's super computer, on which work began in 1984. The Suprenum corporation bases its hope of being able to show the definitive prototype within the predicted time schedule—by the end of 1988—on the successful execution of development work carried out so far. Based on today's forecasts, industry believes it will be possible to put the Suprenum into production as early as 1989. Shareholders of the Suprenum corporation, which is the vehicle for the large-scale joint effort, are Krupp Atlas Elektronik of Bremen with 54 percent (with 27 percent in trust), GMD [Society for Mathematics and Data Processing] of St. Augustin with 23 percent, Stollmann GmbH of Hamburg with 18 percent, and professors Ulrich Trottenberg and Klaus Peinze with 3 percent and 2 percent respectively.

The growing demand for high performance computers makes super computers a strongly expanding future market at an international level. The annual growth rate for high performance computers is estimated at 30 percent through 1995. Demand for supercomputers today is still satisfied primarily with traditional computers known as mainframes. However, the computing times required by these are longer.

The Suprenum I will eventually be able to undertake about 5 billion operations per second. The German system is designed as a parallel system based on the so-called message oriented, dividing MIMD/SIMD architecture. About 2 years ago, this was an unusual decision for the level of research then, as the majority of other super computers at that time were supported by dual memory architectures. That way is nowadays increasingly considered to be dead-end. Scientific circles believe that the next generation of computers, in 3-4 years time, will be a Suprenum II.

08702

FACTORY AUTOMATION, ROBOTICS

New Priorities Urged for European Automation Industries

3698m046 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 464, 28 Sep 87 pp 5-6

[Text] In many fields of industrial manufacturing, assembly costs increasingly consist of 20 to 50 percent of production costs. The level of assembly automation is still low and requires an integrated application of high technologies such as robot technology, computer aided engineering (CAE), industrial networks, image processing, and artificial intelligence.

Before undertaking coherent competitive and future-oriented projects in this complex field, it is first necessary [to complete] an intensive preparatory and acceptance process. This applies equally to the contents of the projects and to potential European partnership. With the intent of building a basis for detailed information and decisionmaking, a preliminary survey was started in mid-1986 on the possibilities of European cooperation in the field of flexible automated assembly systems. The FRG, France, Great Britain, Italy, Austria, Sweden, and Spain participated in the investigation, which has since been completed. The Fraunhofer Institute for Production Techniques and Automation (IPA) is the responsible authority in the FRG.

In addition to analyzing the current condition of assembly automation and evaluating market potentials, other important research and development aspects are considered in this survey. Proposals and needs of industrial users, producers of assembly systems, and research institutions which have been put forward in numerous workshops and expert debates are examined in the investigation. The following development themes have been discussed in the survey: —Assembly planning; for example, manufacturing as well as conception of assembly suitable products, planning and layout of assembly systems, and job distribution and collaborator qualifications; —Assembly systems; for example, programming and control of assembly systems, system integration, quality controls and divergence; —Assembly techniques; for example, handling systems, flexible intervention systems, sensors, automated feed mechanisms, assembly techniques.

The results of the preliminary survey were presented at the EUREKA ministerial conference in Madrid in mid-September.

With a view toward securing continued progress in and the acceleration of the cooperation process in the field of flexible automated assembly systems (FAMOS), the 7 participating countries have agreed to the creation of an information and communication network for a period of 2 years. For this purpose, each country will appoint an institution and a responsible individual.

These institutions will have the following tasks:

1. To inform interested parties on the national level about current and planned cooperation projects.

2. To assist interested parties both at home and abroad in finding cooperation partners.

3. To cooperate with the institutions appointed in other countries by: —informing each other regularly on planned projects, project outcomes and desired cooperation, —arranging talks between interested parties, —organizing workshops and technical talks by experts as needed.

This suggests that assistance in finding partners and projects for cooperation will be offered primarily to small and medium-sized companies. According to EUREKA regulations, it is up to the industrial firms and research institutions themselves to find European cooperation partners and to prepare and agree on partnerships for relevant projects.

08613

President of Leading FMS Manufacturer Interviewed

3698m058 Milan BUSINESS in Italian No 10, Oct 87 pp 61-64

[Interview with Giancarlo Mandelli, president of Mandelli Inc., by Serena Cipolla: "Flexibility Is the Key;" date and place not specified; first seven paragraphs are BUSINESS introduction]

[Excerpts] The 'factory in the dark,' so defined by its inventor, will be ready before the year 2000. It is considered a leap into the future, a great technological opportunity that will stimulate a new industrial revolution similar to the one produced by the advent of the assembly line.

The man with this determination and conviction is Giancarlo Mandelli, 51 year old, president of Piacenza-based Mandelli Inc., one of the leading manufacturers of flexible manufacturing systems (FMS). This new type of plant will turn out modules and assembly lines for automated factories.

This is an ambitious project and certainly not one that has simply been improvised over the last 7 years. In fact, the Mandelli company has invested more than 10 percent of its income from sales on research and experimentation in mechanics, systems development, computer science, and circuit electronics.

This is a substantial percentage for an Italian company when one considers that the firm's turnover totaled over 90 billion [lire] in 1986, representing a 35 percent increase over the previous year. Recent research has been directed at artificial intelligence. This vast field is still largely unexplored. The Piacenza firm plans to produce second generation flexible manufacturing systems by studying the possibility of using sensors that can detect sound and light in order to make robots capable of recognizing and distinguishing objects.

The Americans and the Japanese are also in the race to produce an automated factory. But we should not forget that Italy is the fourth largest producer in the world in this sector.

Giancarlo Mandelli has even managed to sell his systems to the Japanese. The head of a highly esteemed company with overseas sales accounting for 65 percent of total sales, he has kept the firm in the family without having to turn to foreign partners or to become part of a multinational in the sector. A few months ago, 10 percent of the company was sold to a merchant bank belonging to the Banca Nazionale del Lavoro, the first step—along with the auditors' opinion on the company's financial statements [issued] for the last 3 years—toward being listed on the stock exchange.

The Mandelli firm currently has two plants, one in Piacenza and the other in Avellino. In addition, it has a branch in the United States, two in the FRG, one in France, and one in Sweden. There are 27 FMS in the world bearing the Mandelli name.

[Question] Mr Mandelli, there is a question that immediately comes to mind, namely how did your company manage to reach its current position on the market; was it by relying exclusively on company resources?

[Answer] In 1932 my father set up a family business operating in the sector of precision mechanics, while producing prototypes for third parties. In the 1960's, he officially decided to leave the firm and my two brothers and I took over the company.

We completely reorganized the company's activities. We integrated the production of machine tools designed to accept the application of digital controls with the production of components for electronics and systems development.

But this is not all we did. We realized that the production of machine tools primarily involved electronics and systems development. This is what we did to get where we are today: the production of equipment for flexible manufacturing systems.

[Question] And how about future prospects?

[Answer] For us, the future is the fully automated factory. We are preparing for this and are concentrating all our efforts in this area. Moreover, we can safely say that we have a head start on many other people. In fact, in addition to being producers of FMS, we are also FMS users.

In order to produce, we use what we sell. And this puts us in a privileged position. We personally test the products we offer on the market. Thus we are working on two fronts: both supply and demand.

We also have an additional perspective. We are able to subject ourselves to self-examination, to observe the limits, the advantages, and the disadvantages of our own products. We experience directly the problems that our customers could come up against when using our equipment.

In addition, we are able to observe the effects of the introduction of flexible systems.

[Question] What does it mean in today's world for a firm to use flexible equipment for manufacturing?

[Answer] Unlike a few years ago, when mass production was still a new word, now we all know how diverse the market is, that it is subject to frequent changes, and unpredictable. We have to be able to deal with and satisfy demands that are increasingly heterogeneous and fragmented. If we fail to do this, we run the risk of finding ourselves with large amounts of stock on our hands, with all the consequent financial change. To manufacture "just in time," the only solution is to use FMS.

But it is worth emphasizing that this choice means that we have to take a fresh look at our own organization and to modernize the company's approach [cultura aziendale]. This is a condition that meets with resistance from certain areas of the Italian business community, whose outlook is somewhat narrow and traditional.

In fact, the introduction of FMS changes a firm's organization; it alters the labor market, creates new types of professional categories, generates new requirements, and means that the unemployed people [produced by this process] have to be evaluated and reintegrated in technological terms.

[Question] Can you give us some examples of the effects that you noticed within your own firm? How has the work organization changed?

[Answer] New professional categories were created, such as marketing strategists, specialists in the maintenance of flexible automated plants, planners and programmers, and experts in the transfer of technological know-how.

Above all, the way we worked changed. We no longer have the pyramid structure of the past, with workers on the bottom, middle management in the middle, and so on up to top management. Now we work together in teams and the workers have disappeared.

Many of our human resources were put to different uses; certain new categories even broke away from the company and set up their own firms. In some cases, we can say that we contributed to the development and creation of new forms of entrepreneurship.

In addition, we should not forget that automation introduced into factories generates spin-offs in the form of other service sectors. For example, we never would have thought of software houses 20 years ago. A similar phenomenon is taking place in our sector today.

[Question] Therefore, you maintain that the introduction of flexible production systems into a factory does not cause traumas of any kind?

[Answer] Not really. Obviously changing the work organization represents a shock of some sort. The solution to this problem is to introduce automated systems gradually. And that is what we did in our company.

That is why we tried to create a structure that would allow the company to expand. We did not rely on the people, but on the firm's organization.

[Question] However, it is obvious that some profound changes in the mentality of Italian businessmen are necessary in order to reach this goal.

[Answer] Yes. In fact, we have to change our traditional cultural attitudes, especially toward the figure and the role of the entrepreneur himself.

The entrepreneur can no longer be a "single genius." He must have the intelligence and the humility to let others do what they are capable of doing better than he can. A recognition of the importance of professionalism and competence pays greater dividends than a desire to be the sole protagonist and to maintain that "I can do it all."

We are living at a time when industrial and business strategies have become important tools. The idea we have of the firm is also important.

The textbook [accademiche] definition maintains that the goal of a business is to make money. For us, for example, this is not really true.

For us, money is the means and not the end. We decided to reinvest all our profits in the firm. The ultimate objective of our work is to continue to exist, to consolidate, and to grow. We have never taken anything away from the firm, and so far this philosophy has always worked.

In the 1960's our firm had a few dozen employees. Today we have more than 750. We aim to achieve sales [budget] of 130 billion [lire] in 1987 and our development prospects are extremely ambitious.

We often hear it said that we are atypical businessmen—because we understood the importance of a company's image at a time when other people were not yet thinking about such things. Atypical because we decided to bet on southern Italy and we opened a model plant there that is working perfectly. Atypical because we built the computer that controls our machines instead of buying it abroad where it would have cost less. Also, atypical because we created research centers, again in the south, through joint ventures with firms like IBM, placing our trust in the human and professional resources of Italy's southern region.

We have hundreds of researchers who are in direct contact with university institutes. This means that we have constructed a bridge between scientific and applied research. This is an important aspect that helps to determine a good market position for the company.

[Question] How do you rate research on industrial automation in our country?

[Answer] We are not far behind other countries. Italy is fourth in the world, but certain problems put a brake on developments in the sector. Some of these [problems] stem from the academic world. When we look for human resources, we often find that people are not fully prepared.

There are no up-to-date teaching tools, and therefore training is purely theoretical. For example, one glance at any industrial institute is enough to understand that the students have to work with out-of-date, obsolete machinery, no better than scrap heaps in some cases.

The gap between school and industry is still too wide and this has definite repercussions for the whole sector

Another problem to overcome is the establishment of a specific industrial policy placing greater emphasis on research.

For example, this could be achieved by increasing funds for this purpose and easing the procedures to obtain them. There are too many procedures currently in existence and they are excessively complex.

Last but not least, it is necessary to work at increasing the level of know-how of people in the sector. The machine tool sector is full of small- and medium-sized businesses with managers who do not consider research very important. This is an aspect they neglect and, when they do deal with it, they do so without being aware of it.

[Question] Who are your customers? Who in Italy uses FMS today?

[Answer] Primarily automobile manufacturers such as Fiat, Ferrari, or Alfa Romeo. In foreign countries: Volvo, Rolls Royce, and Saab, just to name a few. Then we should mention the avionics sector, the armaments industry, and the earth-moving equipment and aerospace industries.

[Question] Mostly big firms then. What about small- and medium-sized firms?

[Answer] This is a problem that has been discussed a great deal recently. In fact, industrial automation has been chosen, bought and used by large firms (with the automobile industry in the lead), and this has created a technological gap with small firms that have not been able to keep up and to follow the direction in which the market is heading.

We see evidence of this everyday. We receive requests for feasibility studies from these [small] firms that are just beginning to get interested. The good intentions are there, as is the awareness of the path to take, but probably the correct approach and the necessary financial resources are still lacking.

At the head of small- and medium-sized firms we find businessmen who are bright, smart, and technically well prepared; self-made men who also possess on other very important quality—they have a feel for things and understand the need to keep up technologically. The biggest problem is that you have to be prepared to invest several billion [lire] to reduce costs, to introduce flexible production, and to become more competitive. All this encounters resistance within the company, often expressed by the closest advisers to the top executives of the firm.

[Question] You pointed out the lack of financial resources characterizing these firms. I think that this is one of the most difficult obstacles to overcome. The introduction of flexible automation means completely replacing the machinery in a factory. Would it not be possible to integrate the existing machinery [into the new system]?

[Answer] Technically, it is possible to do this, but you would also have to study whether it would make sense financially. This possibility varies greatly from case to case, but often integration means that you end up spending as much or more than what you would have [spent] for complete replacement.

Countries to which Italian Robots Are Exported

Countries	Billions [of lire]	Percentage Variation	Percentage of Total Exports
FRG	208	5.8	14.42
United States	193	7.5	13.36
France	177	43.4	13.36
USSR	109	34.6	7.54
PRC	71	41.1	4.92
Britain	64	6.6	4.40
Switzerland	62	49.0	4.29
Canada	43	-7.9	2.95
Belgium	32	27.5	2.25
Spain	30	47.3	2.05
Sweden	28	18.8	1.97
Austria	27	51.6	1.91
Others	402	20.7	27.7
Total	1.446	7.0	100.0

08615

MICROELECTRONICS

Siemens Pursues Integrated Circuit Development for ISDN

Munich MARKT & TECHNIK in German No 40, 2 Oct 87 pp 158-159

[Article: "A Chance for Europeans," first paragraph is MARKT & TECHNIK introduction]

[Text] Munich—With regard to IC's [integrated circuits] for ISDN, Europeans have the rare chance to be ahead on the semiconductor market. Siemens is quite a way ahead; in fact, it can already present a complete family of IC's for ISDN. While the competition in practice delivers only samples, Siemens has already sold 60,000 IC's, says Hans-Peter Bette, the deputy manager of Siemens, in an interview with MARKT & TECHNIK.

Commercial involvement in ISDN IC's is probably still some time away. But once they begin to take off, they will offer tremendous potential. In the United States and in Europe there are about 300 million telephones with potential ISDN capability. Werner Flagge of product marketing in Siemens' component branch thinks that in the next few years 300,000 to 400,000 telephones will be added. By the early 1990's, this number should reach 5 to 6 million.

The FRG plays a leading role with regard to ISDN. The German PTT allows two companies to conduct field experiments with their ISDN systems: SEL in Stuttgart and Siemens in Mannheim.

But the FRG is not only active at the systems level. Although companies like Intel and Motorola are still in the experimental phase of their first ISDN chips, Siemens has been offering IC's for ISDN for almost 2 years. In the meantime, a continuously expanding family of chips for ISDN is available from this German semiconductor manufacturer.

According to Werner Flagge, "the FRG clearly has a leading role as far as CCITT interface technology is concerned. In this field, Germany is much more advanced that Great Britain or France. For S-type interfaces this time gap is about 1 to 2 years." At present, field experiments are underway [in these countries as well,] but only with 88 kbit/s and only with one B-type channel.

Until now only S and T interfaces have been standardized; CCITT experts are very colloquial—'anxiously seeking' [to standardize] U-interfaces. The longstanding discussion regarding the future standard for signal transmission methods seems to be settled by now. Werner Flagge notes that "the tendency is obviously pointing to a standardization of line code 2BIQ." So far, CCITT has left the U-interfaces open, since every country has different telephone lines and therefore requires a country-specific version of the U-interface.

In order to cope with the specific requirements of individual countries, Siemens has developed the IOM (ISDN oriented modular architecture) concept. The IOM interface is used between the transmission blocks and the 2-3 IC's layer which perform the signaling and protocol tasks. The IOM blocks can be interchanged and directly combined. Additional logic is not required. "This interface is required to cope with the various variants of U-interfaces," explains Manfred Omenzetter, also involved with Siemens Telecom IC's product marketing. "We are leaders with this concept. We have planned it. I am sure that other manufacturers will also adopt the IOM concept." Valvo already offers IC's with IOM, SGS wanted to join, and discussions with U.S. companies are also underway.

The question about the competitive situation is answered by Hans-Peter Bette, the deputy manager of Siemens: "In practice, our competition only delivers prototypes at present. We have already delivered 60,000 IC's worldwide. No other company has an ISDN IC product range such as Siemens. We are clearly market leaders." Werner Flagge adds: "Only when 2 or 3 competitors can deliver comparable quantities will there be a competitive situation. At that point, the competition for market shares will begin and prices will go down considerably. We know from the start that from then on we will no longer be able to live in a fool's paradise."

To prepare itself for [potential] competition, the company is attempting to reduce the chip's surface. At present, ISDN chips are manufactured in Munich with 2 micrometer technology. An even larger integration presents great difficulties for many IC's, because, for example, the echo compensation blocks also contain analog elements such as rapid OPV's which require a minimum structural width. Also, the signal to noise ratio is a problem for chip developers at higher levels of integration.

However, Siemens manufactures not only components, but also exchanges and terminals. Is it not cutting one's own throat when highly specialized chips are sold to the competition? Hans-Peter Bette says: "At first sight it may look as if we are harming our own company. But our systems house knows very well that our components must be sold on the world market to reach the necessary quantities to manufacture these IC's at competitive prices. If we do not go to the free market, then Intel, AMLD, or some other company will do so. In any case, the issue is to produce the highest possible quantity." Manfred Omenzetter introduces still another aspect: "Standards can only be set when they are openly marketed worldwide. Most of our S-interface boards which also contain an S-interface block have been sold to Japan, because the terminals industry is very strong there."

Large data technology companies usually have their headquarters in the United States. Cooperation between U.S. chip manufacturers and computer manufacturers such as IBM, DEC, HP, or Cray is therefore natural, because of geographic proximity. Telecommunications is for Europeans what data technology is for Americans. According to Werner Flagge: "There is a very good basis for the sale of our ISDN IC's in Europe because we have more opportunities for cooperation with manufacturers of ISDN systems—including Plessey, LM Ericsson, Alcatel, Siemens, and so on—than do the Americans." The overseas market is almost completely dominated by AT&T. But AT&T manufactures its own semiconductors. "In the U.S.," adds Flagge, "chip manufacturers have only limited access to know-how." Because Northern Telecom and Mitel also have their own semiconductor activities, many large manufacturers of telecommunications equipment are not open to cooperation. Werner Flagge sums it up: "At Siemens, our products—at present still under price pressure—have a very good chance for success from the perspective of systems

know-how and market potential. Within 1 to 2 years the price war will begin in full; at the latest, this will occur when the Japanese appear on the market as competitors."

08617

Submicron Silicon Center Likely to be Located in FRG

3698m077 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 465, 14 Oct 87 p 7

[Text] No decision on the location of the European microelectronics research center "JESSI" (Joint European Submicron Silicon Institute), planned by electronics companies, has yet been made, according to information from Federal Research Minister Riesenhuber. The minister said in an interview that the chances that this major project will come to the FRG are "very promising." After all the discussions of which Riesenhuber has knowledge, he feels that there is "a strong tendency" for a location "somewhere to the north of Hamburg."

08617

Fraunhofer Plans New Microelectronics Center

3698m098 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 466, 26 Oct 87 p 9

[Text] In the future the Fraunhofer Institute for microelectronic circuits and systems in Duisburg will be able to offer under one roof everything from the analysis of technical problems concerning circuit design and the production of prototypes to models of equipment using the special chips developed. The costs for the construction of the institute's new building, which has just been inaugurated, totaled DM23.7 million and were financed entirely by the Land of North Rhine-Westphalia. So far, an additional DM9.5 million has been spent on scientific equipment. Moreover, in the course of the year, with a 50 percent subsidy from the research ministry, the first oxygen-maximum flow-implantation plant [Sauerstoff-Hoechststrom-Implantationsanlage] in Europe will be installed.

The institute's goal is to develop, in collaboration with industry, integrated circuits requiring special know-how in terms of design, production, or application. Only this know-how, built into the chips in this way, is able to guarantee the market position of many companies on a long term basis and, therefore, to maintain or create jobs. By carrying out parallel research in all disciplines involved in the process of formation of an integrated circuit, Prof G. Zimmer and his colleagues also ensure that their clients will keep ahead in the future.

The institute's customers include companies operating in the fields of measurement technology, automobile construction, and medical technology, as well as most FRG semiconductor manufacturers. In 1986 the institute was able to finance 80 percent of its costs with [its profits from] research and development orders. Exactly two-thirds of this consisted of industrial funds. Since the beginning of 1985, 20 projects have been completed successfully and 32 are in progress.

08701

SCIENCE & TECHNOLOGY POLICY

FRG Commission Decides on Key Institute Subsidies

3698m078 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 465, 14 Oct 87 pp 7-8

[Text] On 28 September 1987, the Federal Government-Land Commission [BLK] for education planning and research subsidies discussed the 1988 commercial plan for research institutes financed jointly by the federal government and the Lands. In 1988, the German Research Society (DFG), the Max Planck Society (MPG), and the 13 institutions from the so-called "blue list" with service functions for research will receive joint subsidies of approximately DM2 billion.

In particular, the commission has planned joint subsidies from the federal government and Lands amounting to DM1.05 billion for the 1988 budget of the German Research Society. This means an increase of DM31 million, or 3 percent, against the previous year. The total amount includes DM331 million for subsidizing special research fields and DM14 million for the Heisenberg program. The subsidies for the Gottfried Wilhelm Leibnitz program, successfully launched by the German Research Association for Advanced Research, have been raised from DM16 million to DM18 million. This special program is being financed by the federal government and all Lands on a ratio of 75:25.

As a joint contribution to the Max Planck Society within the 1988 budget, the commission has recommended that the sum of DM886 million be granted by the heads of the federal and Land governments. This means an increase of DM42 million, or 5 percent, against the previous year. With this extraordinary rate of increase, federal government and Lands aim to provide the MPG with headroom for coming years.

08617

EUREKA Ministerial Conference Communique, Italian Proposal Issued

EUREKA Conference Draft Communique

3698M088 Madrid FIFTH EUREKA MINISTERIAL CONFERENCE DOCUMENTS in English 15 Sep 87 pp 1-7 and pp 1-3FOR OFFICIAL USE ONLY

[Draft communique of the 5th EUREKA Ministerial Conference issued in Madrid, 15 September 1987]

[Text] 1. Ministers from 19 European countries and Members of the European communities commission met in Madrid at the invitation of the Government of Spain, on September 15, 1987, for the 5th EUREKA Ministerial Conference. The conference was chaired by the Minister of Industry and Energy, H.E. Mr. Luis Carlos Croissier.

His Majesty King Juan Carlos I of Spain presided over the opening sesion.

2. The Ministers and the Members of the Commission took note with great satisfaction of the impact EUREKA already has on various key technological and research fields such as Information Technology, Flexible Manufacturing Systems and Robotics, Traffic Control, Lasers and Environment.

The flexible and bottom-up approach of developing the projects is proving to be an efficient way of reaching the EUREKA goals. These projects are complementing the initiatives already in existence, especially those of the European Communities.

They reaffirmed the great importance of EUREKA as a means of increasing the productivity and competitiveness of Europe's industries and national economies in the world market. This is to be achieved through closer cooperation between firms and research institutions in the field of advanced technologies.

In this context they stressed the need to establish a dynamic and homogeneous European economic space, thereby favoring Europe's internal cohesion and external competitiveness.

In this context, they reaffirmed their support for initiatives aimed at attaining this goal, which is contained in the Single European Act, adopted by the European Communities, and in the Declaration of Luxembourg, approved in April 1984 by the Ministers of the European Communities and the EFTA Countries.

3. The Ministers and the Members of the Commission announced 58 new projects with an investment budget of 709 MECU, thus bringing the total number of EUREKA projects to 165, with a total budget of almost 4.00 MECUs. At present more than 600 firms and research institutions are cooperating within the framework of EUREKA.

4. The Ministers and the Members of the Commission took note of the various initiatives designed to attract external private capital to EUREKA projects, particularly as many of these are reaching the end of the definition phase and are beginning the development phases.

They welcomed the declarations made by the European Bankers' Round Table (EBRT), Associated Banks of Europe Corporation (ABECOR), the European Venture Capital Association (EVCA), and the European Investment Bank (EIB), expressing their readiness to establish cooperative links with EUREKA. They made a declaration encouraging other financial institutions and associations to work along similar lines.

The Ministers and the Members of the Commission noted the potential importance of these cooperative links in setting up European joint ventures and in increasing the involvement of SMEs in EUREKA projects; they asked the Secretariat to give a high priority to setting up a network for cooperation with financial organizations.

They took note of the suggestion made by the French delegation to further evaluate the possibility of setting up systems devoted to covering part of the risk involved in EUREKA projects.

They also noted the initiative of the Commission of the European Communities aimed at promoting transnational private capital investment in high technology through innovative financial engineering.

5. The Ministers and the Members of the Commission took note of the work done within the framework of EUREKA in the field of Supportive Measures. They stressed the need to continue with the efforts aimed at removing the technical barriers likely to obstruct greater openness of the European high technology market and they reaffirmed their readiness to give special attention to those measures which are requested by participants in EUREKA projects and to support these requests in the competent Eurolpean bodies.

6. The Ministers and the Members of the Commission noted with satisfaction that the Secretariat is now established in its permanent headquarters in Brussels, and has become fully operational.

They welcomed the setting-up of the database administered by the Secretariat, hosted by the CEC-ECHO and the French MINITEL-CESTA systems, and available to other hosts. The database provides information about projects and project proposals, including those seeking a financial partner. This information is available to companies and R&D institutions, financial institutions, the communication media, and the general public.

7. The Ministers and the Members of the Commission reaffirmed the importance of the effective management of technological change, and noted with interest the findings of the pilot study of management development in the EUREKA context commissioned by the Government of the United Kingdom, which was invited to pursue the promotion of such measures, beginning with an international workshop on this subject to be held in London in November.

They also reaffirmed the importance of the collaboration between industry and research institutions, and they took note of the study on this subject carried out by the

Spanish Chairmanship. They welcomed the Italian proposal to organize an international seminar on this subject. They welcomed the proposal for a Belgian study of the juridical aspects of industrial collaboration in the field of research and development.

8. The Ministers and the Members of the Commission approved the system proposed for the "follow-up" of the progress of the initiative. This system is subject to revision in the light of experience. They analyzed the report of the Secretariat on project progress and expressed their satisfaction at EUREKA's dynamism.

9. The Ministers and the Members of the Commission welcomed the dialog initiated with trade union organizations, and the support for the EUREKA initiative expressed by the European Confederation of Trade Unions.

10. The Ministers and the Members of the Commission expressed their willingness to continue the dialog already established with European industries.

11. The Ministers and the Members of the Commission approved a procedure for the participation, in exceptional cases, of companies and research institutions from non-member countries in specific EUREKA projects.

12. A logotype was presented to the Ministers and the Members of the Commission and they took note that the incoming chairmanship and the Secretariat adopted it as their EUREKA logotype.

13. The Ministers and the Members of the Commission considered the present situation, prospects and future of EUREKA, supported by analyses and reports presented by the High Level Group and the Secretariat. Taking note of the strong interest of European industry and research institutions in EUREKA, considering the substantial number of high technology projects in different sectors now reaching implementation of the research and development phase, and taking into account the fact that EUREKA has successfully developed since the adoption of the Hanover Declaration, the Ministers and the Member of the Commission felt it appropriate to request the High Level Group to report to the next Ministerial Conference on the goals attained so far and the future developments to be followed by EUREKA.

It was stressed that EUREKA should contribute to the realization of a European integrated technological capability.

The Ministers and the Members of the Commission emphasized the importance of the participation of SMEs in EUREKA projects as a vital channel of communication between companies and countries for European technology.

14. The Ministers and the Members of the Commission welcomed the Government of the Kingdom of Denmark to the Chairmanship of EURKEA and accepted its invitation to attend the 6th Ministerial Conference in Copenhagen, in June 1988.

Statistical Overview of the Projects Approved at the Madrid Ministerial Conference

Project Costs (in MECU), by Area of Research

Area	Number of projects	Project costs	Percent of total
Biotechnology, medical & agricultural	11	27.3	3.9
Communications, audiovisual	2	55.0	7.8
Energy	3	25.4	3.6
Environment	2	105.1	14.9
Information technology	9	61.8	8.7
Lasers	6	127.7	18.0
Materials	2	10.0	1.4
Manufacturing & robotics	20	242.4	34.2
Transport	3	52.7	7.4
Total	58	709.0	100.0

Note: Subject areas do not correspond to the categories listed in the descriptions of individual projects.

Number of Projects and Total Costs (in MECU), by Country

Country	Number of projects	Costs	Costs as percent of total
Austria	2	66.0	9.3
Belgium	11	68.4	9.6
Switzerland	3	16.4	2.3
FRG	17	260.1	36.7
Denmark	5	96.4	13.6
Spain	17	122.1	17.2
France	23	339.1	47.8
Greece	2	52.7	7.4
Italy	17	401.6	56.6
Norway	2	13.0	1.6
Netherlands	13	146.0	20.6
Portugal	2	4.5	0.6
Sweden	10	82.3	11.6
Finland	5	35.6	5.0
UK	17	386.9	54.6

Based on 58 projects, with 709 MECU total costs. Note: this implies double counting

Distribution of Project Costs by Number of Projects

Costs	Number of Projects
under 10 MECU	37
10 TO 50 MECU	18
over 50 MECU	3

Distribution of Projects by Number of Participants

Number of projects	Number of countries participating
43	2
7	3
5	4
1	5
1	6
1	8
58 Total	

Italian Cooperation Proposal

[Document issued by the Italian Delegation to the Madrid EUREKA Conference: "Prospects and Actions Aimed at Strengthening Relationships Between Industry, Research Institutions and Universities Within the EUREKA Framework"]

[Text] An analysis of the situation has been presented in the document issued by the Spanish Presidency.

From the overall picture it provides, research organizations appear to participate in EUREKA projects essentially in three different ways: A) research organizations involved as subcontractors performing a support function to companies participating in projects which are fundamentally market-oriented.

B) research organizations (and universities, in particular) which are direct partners in projects which are not directly market- oriented. A typical example is COSINE (for the interconnection between computer centers for the exchange of a variety of communications).

C) research organizations promoting close interaction between a range of industrial firms which would not otherwise be able to put forward and carry out complex projects of international cooperation on their own.

While type A) is the most frequent, type B) applies to a category of EUREKA projects which have not been widespread up to now (even if this may change in the future); type C) examples relate to countries where there are research institutions performing a typical "agency function" in the promotion of industrial development.

We have to face the problem of finding means of increasing participation opportunities and developing realistic possibilities.

To some extent the picture is different in the various European countries and the report from the Presidency outlines ways of interconnection between industrial and research organizations. For example, the availability of Scientific Parks and Technological Areas of industrial development varies considerably.

If EUREKA is to contribute to the creation of an integrated technological area in Europe, is it wise to maintain the research system in its present differentiated form, or would it not be better to reinforce existing links between the research organizations in the various countries?

From the viewpoint of a group of companies wishing to put forward a EUREKA project requiring substantial R&D support, two questions arise with respect to their collaboration with the research organizations in their respective countries:

1. Is it advisable to check the objectives of the project and above all its technical content with research organizations, taking advantage of their knowledge of the state-of-the-art and the technical prospects in the relevant field? The answer may also vary as a consequence of the organizational structure and the size of the companies involved. If this verification is considered worthwhile, how should it be undertaken? Clearly, the responsibility for decisions has to remain in the hands of industry; however, it can be of considerable help to obtain a contribution from research organizations in the project definition phase.

2. As far as development activity is concerned, what criteria should the company apply in deciding between the following three options?

i) strengthening their internal research structure (or in the ultimate, setting up a new one);

ii) setting up via ad hoc contracts collaboration ties with research organizations (or even with individual experts when the circumstances allow) capable of providing a decisive contribution;

iii) creating a mixed organization (a research consortium or something else on similar lines) between firms and research institutions in order to acquire direct control over the results of the "research supplier;" in this way, also reducing administrative delays and ensuring a direct and immediate transfer of the research results.

Here again, the decision-making responsibility remains with the entrepreneur who is risking both financial resources and the future of his business. Moreover, what role can be played by the Public Authorities both in terms of recommendations and guidance when appreciable public resources are engaged in a specific project?

In more general terms, another important question to be answered is the following: can direct interaction between industrial and research organizations favor the formation of project proposals, which could never be conceived if such interaction was not forthcoming. It is likely that a stable relationship between industry and research institutions, even if this does not take the form of a joint company or consortium, may prove to be very productive indeed.

From the viewpoint of research organizations, which is the best way for them to provide meaningful support and what should be done to facilitate their intervention? A research contribution can take place in a "direct" way either at programmatic or structural level (parallel to cases described in points ii) and iii) in the preceding paragraph); however, one should not lose sight of "indirect" contributions such as scientific and technical formation of personnel, the creation of research infrastructures to serve industrial needs in particular, etc.

The report issued by the Presidency puts forward seventeen suggestions designed to improve both the quantity and the quality of interactions between the industrial and research sectors in the EUREKA framework. These suggestions relate to organizational, financial and institutional aspects and are addressed both to governments and to industrial and research organizations.

In order to examine these seventeen proposals in more depth and provide possible answers to the many questions raised in this document, we think it advisable to hold an international seminar on this important subject, involving substantial participation from both industry, research institutions and universities. Basic reports on the most important issues will be prepared and circulated in advance among the participants. Inter alia, it is hoped in this way that the valuable contents of the report prepared by the Presidency for this EUREKA conference in Madrid will be put to the best possible use.

08800

Bundestag Approves Semiconductor Patent Law

3698m075 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 465, 14 Oct 87 pp 8-9

[Text] The designs [Topographien] of semiconductor products (so-called microchips) are not sufficiently protected against illegal reproduction by either German law or EC law. Such protection is urgently required, given the cost and [expenditure of] time involved in the development of semiconductor products. An EC guideline dated 16 December 1986 calls for member states to implement appropriate protective measures by 7 November 1987 at the latest. In the United States, temporary protection for members and residents of EC member states ends on this date, after which time protection for aliens under U.S. law applies only when the foreign state in question also provides protection for U.S. citizens that is basically comparable to U.S. law.

On 17 September, the FRG Bundestag adopted, by a large majority, the draft of a law for protection of the design of microelectronic semiconductor products. (Semiconductor protection law; Bundestag document 11/754). The proposed law establishes a general commercial protection law combining the elements of copyright protection with those of the commercial protection law. In essence, the draft of this bill in the version accepted by the legal committee contains the following rulings: —The subject is the design as such, when and in so far as it shows unique characteristics. —Owner of the protection law is, in theory, the party which developed the design or had it developed within the framework of a work or contract relationship. —The requisite central registration must be deposited with the German patent office. —Protection commences with the first commercial application of the design or with the application for its registration, depending on which of the two comes first. In the event that the design is initially used commercially without registration, an application for registration must be made within a period of 2 years. —Commercial applications of a confidential nature do not constitute protection. —Patents can only be claimed when the design has been registered with the patent office. —Patents last for 10 calendar years following the year in which patents were granted. —Protection can only be claimed for a period of 15 years following the initial registration of the design. —The patent law forbids reproduction and exploitation. It does not include private sector dealings for noncommercial purposes, reproduction of the design for the purposes of analysis, evaluation, or training, and the commercial exploitation of a design produced through analysis or evaluation (so-called "reverse engineering"). —Violation of patents will result in claims for injunctions and payment of damages. —Violations of the norms against reproduction and exploitation are punishable.

08617

EC Commission Issues Reports on Information Technology, Services

EC Council ESPRIT Proposal

Bonn TECHNOLOGIE NACHRICHTEN-PROGRAMM INFORMATIONEN in German No 408, 18 Sep 87 pp 2-8

[Text of "Proposal of the EC Commission for a Resolution by the Council on a European Research and Development Program in the Field of Information Technologies (ESPRIT);" date of issue not given]

[Text] Introduction

In its report to the Council on the second phase of ESPRIT (KOM(86) 291 of 21 May 1986), the Commission described the objectives, reasons, and subject matter of the second phase, as well as a related administrative plan. In view of the discussions in the council and in parliament with regard to the basic program for EEC activities in technological R&D (1987 - 1991 (KOM(86) 430), the Commission has issued a draft proposal for a council resolution on the continuation of ESPRIT which is submitted here. This proposal is submitted as a separate program within the basic program.

Increasing costs for R&D due to the strong dynamics of the research area along with an element of uncertainty—which means that a number of technological approaches must be made simultaneously—are the main restrictive factors for the IT [information technologies] industry. At the same time, international competition and growing R&D resources worldwide have paved the way for a coordinated approach in Europe. For this reason, the objective of the future program will be to give a series of researchers the opportunity to accept the challenge of specific, ambitious goals.

In order to achieve the proposed objectives, the scope of ESPRIT should be such as to take into account the willingness of industry to build up cooperation within the EEC. The Commission based its estimate regarding the overall scope of activities on the technological goals which must be achieved by the EEC's IT industry in order to remain competitive in the medium and long term. These objectives determine the scope and content of the ESPRIT program. The expenses [involved in it] and contents were estimated in close cooperation with industry. Industry has proposed and committed itself to provide 40,000 man years for the intended overall duration (1984-1993) of the program.

It is therefore essential that efforts are made at the Community level to provide the resources necessary to ensure achievement of the proposed goals in timely manner. In addition to approximately 12,000 man years already covered by the first phase of the program, another 28,000 man years will be required for new projects. This number should be sufficient to achieve the desired critical mass effect. In accordance with provisions made in the strategic program, it is proposed that, of the 28,000 man years required, 21,000 man years be scheduled for new activities in the period from 1988 to 1992. These estimates are based on the following:

—the present level of skilled personnel in the selected areas;

—present and future investment in R&D worldwide and in Europe;

—the substantial increase in public funding of R&D in the United States and in Japan;

—programs currently in operation or in the planning stage in EEC member states which can serve as a basis for ESPRIT.

A Community budget of 1.6 billion ECU for the duration of the basic program is set on an assumed contribution of 50 percent. An additional 190 million ECU for 1987 to 1988 is already covered by the first phase of the program. The Commission will also support the financing of cooperative transnational projects not included among the precompetive R&D activities currently carried out by applying new methods for financial innovation.

A. R&D Projects

R&D projects will operate in the following three sectors:

1. microelectronics and peripheral equipment technology 2. data processing systems 3. IT applications

1. Microelectronics and Peripheral Equipment Technology

The projects in this area are primarily aimed at increasing the competitiveness of the EEC microelectronics industry in order to supply the IT industry with state of the art components and subsystems. This is particularly true in the field of semiconductor technology, which is necessary for the development of complete systems. For this reason, and with a view toward supporting the development of application systems, the projects cover—along with selected peripheral equipment technologies—the technology for design, production, and testing of application-specific integrated circuits (ASIC). The objective is to achieve systems on chips. These circuits include highly complex logic circuits with up to four million elementary functions and high speed circuits of lesser complexity up to a range of 5 GHz.

The R&D activities to be carried out include:

Highly integrated circuits: The goal is to develop logic circuits with up to four million gates. The emphasis will be on applications permitting a high level of parallel operation, such as array processors or systolic arrays. For this reason it will be necessary to:

—provide user-friendly CAD systems including automatic layout and design verification;

—develop low-voltage high integration processes including optimization of automatic, flexible production lines to facilitate production with a low rejection rate.

High speed integrated circuits: The goal is to develop circuits for real time processing of large amounts of data in cases where parallel architectures are not sufficient due to the serial bit rate. They are potentially useful in supercomputers or in front-end processors for telecommunication purposes.

Output objectives:

• 5 to 10 GHz clock frequency or gate delay times of less than 50 ps;

• complexity of more than 10,000 gates.

The main projects for the achievement of these objectives are:

—development of a high speed process—GaAs field effect transistors are probably suitable;

—special CAD tools to optimize circuit speed;

—special packaging technologies for the GHz range.

Multifunctional integrated circuits: The objective is to develop complete systems on a single chip to combine digital and analog functions and cover wide speed ranges. Complexity of up to one million transistors, gate delay times of 50 ps, output control, and storage capacity (non-volatile) will be required for control of peripheral equipment (screen and network control, memory administration), telecommunication equipment (language and image processing), and for assembly and office automation (intelligent sensors and actuators). To increase the output of very large data processing systems, integrated optoelectronic circuits will be developed and used in, for example, distributed, optically linked processors.

The main projects will be:

• development of production processes that are particularly suitable for selective applications;

• development of CAD tools for multifunction circuits, e.g. design of analog-digital circuits.

Special emphasis will be placed on the definition of standards both in the area of software (data interchange, transferability of tools between different CAD systems, and compatibility with production processes) and in the area of hardware, with the aim of increasing the level of automation and flexibility.

Peripheral equipment technology: This part of the program aims at developing those technologies necessary to ensure that Europe will play an adequate role in the future development of peripheral systems and will gain a significant share in the world market. Other projects to be considered concern magnetic-optical and optical mass memories as well as retrieval systems, non-mechanical printers, videotext technologies, intelligent sensors, transductors, and drives.

2. Data Processing Systems

The main objective of this area is to combine the tools and technologies in the hardware and software areas to facilitate the development of the data processing systems of the 1990s. Special attention will be paid to new approaches to system design which allow high quality complex systems to be developed efficiently. In order to develop the required methods and tools, it is essential that all aspects of the system (e.g. architecture and interfaces) are considered while simultaneously integrating new data processing technologies. The work in this sector will make it possible to produce systems (as complex as those presently being produced) with a significant increase in productivity. For instance, the methods and tools developed will make it possible to reduce development costs of certain system components (e.g. microprocessors, real time software modules) to 10 percent of the present costs.

The R&D activities are divided into four subcategories:

System design: This area is concerned with the overall process, starting with a definition of the requirements of an IT system, on through production, sale, and maintenance. The activities include:

• Assessment of methods and tools, instructions for introducing the methods and the matrices [of parameters] for product assessment.

• Integration and rationalization of integrated programming systems for interfaces for the environment, project support environments, and data processing technologies.

• Reusable system components, automatic generation of high level programs for real time systems, formal technologies and methods.

Knowledge processing: This area is concerned with the development of systems to aid in making decisions in the case of uncertain and incomplete information. The activities include:

• Parallel architectures and coupling of parallel processors, programming, and verficiation technologies.

• Distributed systems with semiautonomous components.

• Specialized architectures for signal processing and expert system subsections.

Signal processing: This area is concerned with the necessity of processing complex signals of a physical nature (for example temperature, pressure, images, natural language). The activities include:

• Formal description of the information flow, symbolic processing.

• Preliminary processing, identification of characteristics, classification, fault correction methods.

• System components for signal processing, real time systems.

• Advanced technology for multisensor-signal processing systems.

3. IT Applications

The primary objective of this sector is to improve Europe's capacity to integrate IT in systems that can be used in a broad range of applications, as well as to validate the results in pre-selected, realistic environments. The R&D activities are divided into three subcategories:

Computer integrated assembly: The goal is to form a technological basis for system providers in order to comply with international market requirements

At the same time, rapid progress of technology based on IT is expected to complete the process of modernization in assembly plants.

This area covers not only the application of IT in the production sector but also in the whole range of industry including process engineering.

The introduction of the "open system" concept which encourages a variety of providers is an effective way of achieving the goal in this sector.

The projects include:

—Design and analysis systems allowing flexible design of products in order to optimize efficiency, material requirements, and other factors effecting production costs.

—Process planning and monitoring with the aim of increasing efficiency and availability of plant and equipment, optimizing man-machine interaction in production planning and in control systems, introducing real time applications and supporting time-optimized production;

—Robotic systems;

—Integration of material handling systems (including robots) in production and assembly processes. Problems concerning tool change, monitoring, cleaning, waste disposal, assembling, and so on must be solved. Special attention will be paid to finding solutions for smaller production lines.

—Computer integrated monitoring of process applications to improve production efficiency;

—Architecture and integration methods, including the development of processes and tools for installation, operation, and monitoring of computer integrated assembly systems as well as testing projects with a view toward fulfilling various assembly requirements.

Integrated information systems: This section is concerned with R&D in system integration for selected applications. The applications cover both home and office.

The activities include:

—Analysis and support of the user environment, a reduction in introduction time, and productivity increases by improving the man- machine interaction. Special attention will be given to the requirements of less experienced users and to flexibility;

—System technology, including system integration and testing tools, problems related to reliability, availability, and security of systems;

—General communication technologies and integrated office systems, including multi-media processing on the basis of open systems, extraction, distribution, and monitoring of information, support of remote workstations, and selected special functions;

—Distributed systems with a particular emphasis on the integration of expert systems and advanced distributed storage systems;

—Data collection and monitoring systems for non-industrial applications such as in the home or lab, including remote monitoring and networking of appliances, and administration of data collection systems.

Support Systems for IT Applications: This sector is concerned with the integration of IY-based components in subsystems. The main objective is to provide low-cost technologies with a wide range of possible applications. Special attention will be given to modularity and protection against breakdown.

The activities include:

—Workstations for a variety of applications;

—Storage and processing subsystems for individual and distributed systems;

—Local networks and related basic services;

—User-interface subsections (e.g. vision, language, handling);

—Subsystems for environmental interfaces (e.g. vision, image comprehension, laboratory data collection, monitoring and control, and robots).

A limited number of technology integration projects will be carried out in all three sectors, microelectronics, peripheral equipment technology, information processing systems, and IT applications. These projects will have ambitious, well-defined industrial objectives and

will be planned and described in the schedules with the required level of precision. They will demand great effort on the part of EEC industry.

B. Measures in the Field of Basic Research

The measures planned in the field of basic research are aimed at complementing the proposed R&D activities for IT and at giving the research activities in selected sectors that require long incubation periods a dimension which necessitates a community approach. They include promotion of high level technical training in sectors that are of special importance to the EEC. The measures are particularly aimed at encouraging highly qualified research institutes to take an international approach to IT.

The fields of activity include:

—Molecular electronics;

—Artificial intelligence and cognitive science;

—Application of solid state physics to IT;

—Advanced system design;

and other areas of pure research which will be established during the program.

C. Auxiliary Measures

The main objective of the auxiliary measures is to provide the infrastructure necessary for optimal exploitation of R&D activities that are related to ESPRIT and are carried out in the course of the program.

The auxiliary measures include in particular:

—Coordination of R&D programs of the EEC and member states with programs at international level, collection of information within and beyond ESPRIT, as well as distributing this information in EEC member states.

—Coordination and documentation of ESPRIT program standards with reference to national and international norms.

—An information exchange system to facilitate communication, thereby supporting a technically valid execution of R&D projects both at the managerial level and in the dissemination of project results.

D. Financing

Schedule for the Necessary Funding (in millions of ECU)

	Obligations								
	1984/86	1987	1988	1989	1990	1991	1992	1993	Total
First phase (1984-1988)	560	173.5	16.5	-	-	-	-	-	750
Second phase (1987-1991)	-	-	263.5	465	404	137.5	330	-	1600
Total	560	173.5	280	465	404	137.5	330	-	2350
Second phase									
Contracts	-	-	256.4	442.5	380.2	112.7	304.0	-	-
Personnel costs	-	-	4.7	14.5	15.5	16.5	17.5	-	-
Administration costs (including costs for external, independent assessment by highly qualified experts, presently estimated at 210,000 ECU	-	-	2.4	8.0	8.3	8.3	8.5	-	-

				Expenses					
Total	263.6	187.4	174.5	373	430	311.5	310	300	2350
Personnel costs	-	-	4.7	14.5	15.5	16.5	17.5	-	-
Administration costs	-	-	2.4	8.0	8.3	8.5	-	-	

1984/86 includes carryovers from previous years

Commission Report on Information Services

3698m014 Bonn TECHNOLOGIE NACHRICHTEN-PROGRAMM INFORMATIONEN in German No 408, 18 Sep 87 pp 9-18

[Text of "Report of the Commission on the Execution of a Community Policy and a Plan for Priority Measures for the Development of a Market for Information Services;" date of issue not given]

[Text] Introduction: Europe and the Development of Information Services

The rapid development of new technologies, specialization in production and service industries, and the diffusion of trade and international activities have all led to an almost exponential growth in the range of information necessary for economic and social activities.

It is estimated that at present, the volume of new information disseminated every year exceeds the total volume of knowledge accumulated by man up to the beginning of this century.

The application of new technologies [microelectronics, computer science and telematics] has become essential to be able to cope with this information explosion. However, the new information technologies have also radically changed the traditional balance in the structure of information dissemination.

1. Primary changes in the structure of information dissemination

Information today is both a polymorphous complex of activities, and an essential raw material at all levels of the economy. The same information can be transferred by various coexisting generations of information services. This means that the traditional publishers of newspapers and books can find themselves competing with non-conventional publishers who make use of radio, television, and new telematic services.

At the same time, information exists at all levels of activity and in all branches of the economy, and may concern anything from assurance of technological progress to market information or production monitoring.

Information is being increasingly regarded as a commodity strongly dependent on economic dimensions, due to the rising cost of processing relevant information—which must be collected, coded, verified, put in the correct form, and stored, thereby demanding a substantial initial investment.

Technical, legal, economic, and financial information is a valuable commodity sold by specialized firms at a high price. Communication among firms has gained substantially in significance and represents an investment figure which exceeds that of the film industry. It is estimated that the wide range of data processing activities currently accounts for 55 percent of the assets and two thirds of the gross domestic product in Europe.

Due to technological progress, the development of information and communication industries, as well as the policies concerning this development are gaining influence in the economy.

To a greater extent than ever before, information has become an instrument of power among firms, in society, and between nations.

2. The prospects: Growing demand means rapid growth of information services

The growing need for information is accompanied by a change in the nature of the demand. Formerly only documentation experts required data bank services. Today, many people involved in trade and industry must have direct access to an ever-increasing range of information services. These new users need information tailored to their requirements, easily accessible, and which allows the maximum level of interaction.

If the suppliers of equipment and services can meet these requirements, the prospects for the European information market are particularly stimulating.

—With a total budget of approximately 5 billion ECU, the 93,000 libraries in the EEC represent an important potential market for advanced information services. They are playing an increasing role as agents and consultants for querying databases.

—Desk top catalog and technical document publishing could achieve a turnover of around 5 billion ECU by 1990.

—Electronic mail services (electronic mail, electronic data transfer) are growing rapidly and could achieve a turnover of around 6 billion ECU by 1990.

—The European information services market will experience an increase in turnover from 1 to 10 billion ECU in 10 years. That is an annual growth rate of between 20 and 30 percent.

The potential for the creation of jobs stemming from the growth in information activities cannot be ignored. An estimated 100,000 people are presently employed in the European information sector. If libraries, the traditional publishing sector, telecommunications, and the production of electronic equipment are added to this, the job figures run in the millions.

3. The situation in Europe

In view of these dramatic changes, Europe is faced with a challenge. Although it has all the important advantages, its position in the international information market has become relatively weak since the appearance of electronic information services.

Europe currently produces half as many on-line databases as the United States. In 1986, the turnover of most European providers of electronic information services was only half that achieved by their American counterparts. The EEC market is hindered by numerous technical, legal, and linguistic barriers. These difficulties hinder the free exchange of data and services and, therefore, the realization of the economic dimensions necessary for the creation of advanced information services.

Private investment in this sector is also hindered by the lack of reliable statistics on the development of the market and by uncertainties with regard to government policy. Approximately 70 percent of European databases are set up by the public sector or by non-profit organizations, while 75 percent of databases in the United States are set up by the private sector.

It seems to be difficult for the individual member nations to create market conditions enabling providers of European information services to assert themselves against worldwide competition.

The Community as a whole, however, possesses a number of incontrovertible advantages which only have to be exploited:

—a market with 320 million inhabitants which must be united;

—substantial sources of scientific, technical, and cultural information;

—a competitive industry and a high level of know-how in the telecommunications sector;

—a real capacity for innovation as proved by the incomparable success of videotext services for the mass market in Europe.

The same political will which made it possible to create the necessary conditions for EEC policy on the establishment of a European market for telecommunications and for improvements in Europe's competitiveness in the computer and electronics sectors, must be turned towards exploiting these advantages.

Steps Towards An EEC Policy for the Information Services Market

Extensive consultations have taken place in recent months between the Commission and representatives of member state administrations as well as with industry and users of information services. These consultations are based on initial ideas developed in the document (85)658 and are aimed at reaching an agreement with regard to the objectives and procedural guidelines for EEC policy on promoting the development of a market for information services.

1. Objectives

The goals of a policy allowing maximum exploitation of the advantages offered by the European community and optimization of national efforts in both the public and private sectors are as follows:

—Establishing a domestic market for information services;

—Stimulating and strengthening the supply capability of European information services providers to supply the market in a competitive manner;

—Promoting the use of new, advanced information services in the EEC;

—Strengthening solidarity and cooperation within and outside the community in the information services sector.

Information services must be able to develop freely in a large domestic market that allows them to reach the economic dimensions necessary for their growth and progress. This growth is a prerequisite for the development of information exchanges within the community and worldwide.

Strengthening the supply capability of the European information service providers is also essential to ensure a stable position for the community in the international market, and will facilitate the provision of a new generation of services required by research, trade, and industry.

The creation of an awareness in new users and the promotion of demand in Europe, which is generally slower than its competitors to fully exploit the opportunities offered by new technologies, is essential to ensure the survival of modern information services and will stimulate investment.

As for the rest, the establishment of a domestic market for information services cannot be completed if certain regions of the community are excluded. The Commission must pay special attention to initiatives that can contribute overcoming regional discrepancies regarding the supply of and access to information. This also applies to extension of the infrastructure necessary for telecommunications, which is the subject of the STAR program. This goal must also be considered when, in an addition to this document, the Commission defines the initiatives for the achievement of the proposed objectives in more detail. The emphasis that will be placed on the development of information services for medium and small-sized industry is of particular interest to underdeveloped regions of the Community due to their economic structure. This interest will be strengthened by the selection of certain pilot projects as well as by the development of specific measures, particularly in the area of training.

The internal solidarity of the Community serves to strengthen the bond between the various regions and must be made the subject of increased efforts. This will encourage uniform policies and their representation by international bodies (OECD, GATT) that deal with questions of economic activity in connection with the supply of, and demand for information services.

The measures necessary for the achievement of the proposed aims are set out below.

2. A plan for priority measures

Two separate approaches, each serving to complement the other, have been proposed in order to achieve the above mentioned objectives:

—Continuous efforts to improve market conditions and to promote the use of modern information services;

—Pilot and demonstration projects, which can have a catalytic effect on the development of the information market.

The following plan for priority measures is based on both of these approaches:

A. Creation of a European observation committee for the information market

At the moment there is very little reliable quantitative and qualitative data available on the market, the production and sale of information services, as well as on the effects these services have on the rest of the economy and the requirements of the users. The Commission proposes the creation of a European observation committee, which will:

—Collect, classify, and assess existing data on the various information market segments;

—Detect gaps and define priorities and joint methods for collecting comparable data at the EEC level;

—Compile a synthesis of the results of socio-economic studies on the information market at the EEC level;

in order to supply the information necessary to formulate policies, and as a guideline for investment. With the help of a group of experts, the Commission will define the committee's constitution, mandate, and operation methods within six months of the report's submission to the council.

B. Removal of technical, administrative, and legal obstacles to the creation of an information market

There are numerous technical, administrative, and legal obstacles dividing the information market. The measures to be taken to remove these obstacles are concerned with standards, the harmonization of certain regulations, and the improvement of conditions for the transfer of and access to information services.

1. Measures concerning standards

The Commission will initiate normative measures in the area of access to databases. These measures will be based on selective advances in questions of standards in the sectors of telecommunications and the new information technologies. These initiatives will complement those already undertaken by the commission in consultation with the Senior Officers Group for Telecommunications (SOGT) and the Senior Officers Group for Information Technology Standards, (SOGITS) and are particularly concerned with:

—Standardization of host system and network interfacing procedures; —Automatic transmission of the parameters for terminals configuration through networks; —Standardization of commands for querying databanks;

—Standardization of the data transfer format using diskettes and in the case of remote input and remote input commands; —Definition of a standard for the logical structure of data (audio, video, and text) independent of the type of storage medium; —Drafting of a protocol for transferring orders for primary data between the host systems of bibliographical databases and services that supply primary data in electronic form; —Standardization of database descriptions to facilitate the user's selection process; —Standardization of the designation and coding of fields in databases of the same type and in the same information sector. This will simplify querying by occasional users and remote input. It will also allow the search strategy to be automatically transferred from one database to another; —Standardization of indexing and cataloging regulations for electronic products and information services; —Active promotion of existing standards. These efforts with regard to database access standards will at the same time be supported by projects initiated in the course of other community programs, such as DELTA and AIM.

2. Removal of legal and administrative obstacles

The work of the observation group for legal questions regarding the information market, created in 1985, has made it possible to estimate the size of the problems and establish the necessity of community action to prevent the appearance of new obstacles stemming from differences in basic conditions. With the aid of studies made by certain international bodies and expert committees, the Commission will submit proposals by 1990 for further priority measures.

The Commission will initiate a broad debate on copyright questions, with particular regard to software, by publishing a green book on this subject. The Commission will also intensify its investigation of problems regarding documentation of electronic transactions, electronic transaction fraud, as well as the information services liability.

Regarding the protection of personal data and the safeguarding of privacy in user queries, the Commission will continue to take all the necessary steps to enforce the convention of the European Council in all member states and to initiate other measures if problems arise.

C. Improvement of transfer and access conditions for information services

Improvements in conditions of access to telecommunications services will be dealt within the telecommunications policy. [The Commission will place a special priority on improving the quality of services and on cooperation of the packet switching networks until a service-integrated telecommunications network (ISDN - Document number KOM (86)205) is introduced in a coordinated way.] In the course of the debate resulting from the publication of the green book (Document KOM(87)290) on telecommunications on 10 June 1987, the Commission will discuss conditions of access to the networks as well as ways and means of obtaining an accelerated and harmonious development of high-level services with special regard to questions concerning the fee scale.

The Commission will not restrict its attention to information processing by means of telecommunications. It will continue its efforts to achieve concerted action between mail service administrations and publishers to improve distribution of technical literature (books, technical and economic journals, and also information products on new storage media such as optical discs).

The Commission will also examine questions regarding the fee structure for information services. In the interests of the users it will pay special attention to improving the comprehension of the fee structure.

D. Measures to improve cooperation between the public and private sectors

The public sector plays an important role in promoting the supply and demand of advanced information services. The search for joint approaches is a necessary prerequisite to the initiation of an effective Community policy for promoting the information market, and in particular for the following:

—Access within the entire Community to non-confidential data owned by the government for processing and commercializing [such data] by private enterprise; —The establishment of standards for the provision of advanced information services by the public sector; —The potential for the public sector to serve as pioneer in the use of innovative services.

In consultation with the relevant administrations, the Commission has begun work to define joint approaches in these sectors taking account of factors that are specific to the various nations. The joint approaches resulting from this work will form the basis of initiatives to be submitted to the Council for approval in 1988.

E. Initiation of pilot projects

The dramatic changes in the demand for quality of service calls for the creation of a new generation of information services. These must be much easier to use and more adapted to the variety of languages in Europe and the complex and extensive requirements of industrial users.

Present conditions on the EEC information market do not provide grounds for optimism that such services can be developed spontaneously and rapidly in the near future. The Commission believes that a positive stimulation effect could be achieved by EEC support for pilot or demonstration projects defined by users and/or industry.

The objectives of these pilot and demonstration projects are:

—Investigation of the obstacles to the creation of European services and a common information market, as well as the testing of practical solutions for the removal of such obstacles; —Promotion of synergies and cooperation between the various groups necessary for introducing innovative products on the market; —Investigation of the market reaction to these products; —Investigation of medium-term priorities in accordance with market requirements.

The planned projects must be arranged in such a way that they can serve as a catalyst to the development of information services, and to the market as a whole. They must also:

—Achieve an optimal combination of expertise by means of comprehensive (among groups from different sectors) and transnational (among EEC member states) cooperation; —Promote cooperation between specialized small-sized industries and large industry; —Direct their efforts at precisely defined user groups of various member nations, and particularly in small-sized industry; —Take account of the various languages within the EEC; —Investigate market segments with potential for growth and pave the way for potentially successful information products and services; —Contribute to the creation of a significant initial demand by working toward generating a strong demand in the public sector for certain projects; —Make an active contribution toward improving ease of access to the services and toward removing regional differences in the supply of and access to information services; —Wherever possible, take advantage of existing technology infrastructure and encourage the provision of on-line services and/or other services and products with machine readable storage media; —Possess a mechanism for observing and assessing the projects so that the experience gained can be applied to other sectors.

Obviously, only some of the projects can fulfill all of these conditions simultaneously, if at all. Every individual project must therefore be examined carefully with regard to its strategic effects on the market. The application of the most advanced instruments and the transfer of acquired know-how for providing products and highly developed, easy-access information services will be the most important reasons for EEC support.

The scope and form of EEC support will depend on the type of project and its financing requirements. Support, however, may not lead to a distortion of competition.

The projects that comply with the conditions set out above and which are submitted by a restricted industrial group will receive initial aid corresponding to the actual need, which usually does not exceed 25 percent of the development costs. EEC support will not necessarily be granted in the form of a subsidy. It can also be used to mobilize funds in the form of low-interest loans, guarantees, or risk capital.

Other projects of general interest but with little hope of attracting investment (e.g. databases of strategic interest for the execution of government policies, or joint infrastructures facilitating access to databases) could be partly financed by the community in conjunction with the users and the member states concerned. Except in special cases (such as investigative or feasibility studies called for by the Commission), financial support will be limited to 50 percent.

Along with these pilot and demonstrative projects, the Commission will continue those measures that have already been initiated, particularly those of the 5-year-plan for developing the specialized information market to close the gaps in the supply of scientific and technical databank services in the priority areas such as industrial and research information, information on patents, material databanks, image databanks, and so on.

This report does not include access to information resulting from the activities of the Commission itself, which is financed by other means from the respective budget items.

F. Measures concerning libraries

Public spending on libraries in the community amounts to 0.5 percent of overall public disbursements (not including the defense budget). Beyond their indispensable role in the cultural sphere, as acknowledged by the council in its resolution of 27 September 1985, libraries also play a growing role as mediator, by facilitating industry's access to the wide variety of databases and to other available scientific, technical, and commercial information sources.

In addition to the pilot projects set out above, the Commission will also prepare a special library campaign during the course of 1988 to promote communication between libraries within the European Community and to encourage the use of new information technologies.

G. Improvement of user access to existing information services

The user is faced with a wide range of existing databank services and their complicated methods of use. For this reason, the following conditions must be fulfilled:

1. The user must be given comprehensive information on the spectrum of services available in the community. The Commission intends to expand the multilingual indexes (e.g. the DIANE GUIDE) stored in the host system ECHO and to add to them other information sources (Broler, Technical Consultants) that meet users' needs.

2. Help desks must be set up at the community level to overcome technical difficulties regarding access to international services.

The Commission will intensify the auxiliary services provided by ECHO to the user. It will also examine the possibility of stimulating cooperation between information agents through a network of officially approved agents so that access to the most suitable information sources is guaranteed and users' questions are answered.

3. Users must be informed of the wide range and the [high] quality of the European information services.

Experience with Euronet DIANE has shown that with the help of sensitization measures taken by the community, the number of European on-line services is now thirty times larger than it was 5 years ago. The providers of information services regard these measures as essential to the success of their commerical efforts. The users in trade, industry, and research also welcome these measures because they serve to disseminate information on the available databases. They are particularly important with regard to the objective of expanding the market to the millions of potential professional users who have no special skills for dealing with information systems.

The Commission will propose that the member states execute a coordinated campaign to raise awareness of the variety and quality of European information services.

4. The existing structures for training must be strenghtened. Support for electronic information services is closely connected with questions of training and instruction. The Commission is of the opinion that certain types of community assistance in this area are justified (e.g. measures to promote the command language already used by numerous suppliers in the community.) The Commission will expand the support for user training by intensifying the intorductory courses organized by ECHO. In addition to this, ECHO will develop new automatic teaching aids based on transnational pilot projects developed in the course of the DELTA program.

5. The user must be given assistance to overcome existing language barriers. The multilingual nature of the community is an important part of its cultural heritage and the services of the third generation must take account of this in order to gain a strong position in the domestic market. New technologies, particularly computer aided translation, can make a contribution to the creation of such services. The Commission intends to thoroughly investigate the language question so projects that have already been initiated (EUROTRAN and SYSTRAN) can be completed and expanded in order to integrate the variety of languages in the information services.

6. The role of European institutions as suppliers of information must be increased. Special efforts must be made to improve access to information by means of user-friendly systems such as those presently being developed in the course of the INSIS program.

Execution of the Plan for Priority Measures

1. General approach

Establishing of pilot projects to act as catalysts for the development of the information market is one of the ways the Commission intends to achieve its objectives. It is not the only one. Further measures concerning priority objectives will be initiated either directly or with reference to closely connected Community policies (such as the development of the domestic market, telecommunications, and innovation policy, etc.).

2. Initiation phase

Due to the flexibility necessary to ensure the success of a complex policy, the Commission proposes to begin enacting the priority measures with a 24 month initiation phase during which budgetary funds of 15 million ECU for 1989 and 20 million ECU for 1990 are regarded as necessary.

During this phase, the Commission will continue current measures to improve market conditions for electronic information services. This includes the establishment of a European observation committee for the information market, support for standardization, and continuing the study of legal questions. This will lead to proposals for recommendations and guidelines to be submitted to the Council and to an improved orientation regarding the role of the public sector in the information market.

At the same time, the Commission will increase its support activities for the user, and will propose a coordinated campaign for the member states to promote the range and quality of European information services.

The Commission will also initiate a limited number of pilot or demonstration projects.

The objectives and criteria for the selection of the projects have been defined in consultation with representatives of the Information Services Providers Group (ISPG), representatives of the Information Services Users Group (ISUG), and with the senior officers of the SOAG.

Project proposals will be collected by means of tenders published in the Official Gazette. The projects will be selected by the Commission in conjunction with the SOAG.

At the end of the 2-year phase, the Commission will submit a report assessing the results achieved to date to the council and to the European Parliament, along with the resulting information for the continuation of the projects until 1992.

08706

EC Proposes Program to Stem Loss of Scientists

3698m080 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 465, 14 Oct 87 p 10

[Text] Increasing emigration of highly qualified experts from the EC countries to, for example, the United States is a serious threat to the Community, as the EC Commission stresses in the commentary on their proposal for a new EC subsidy program entitled SCIENCE. In the period 1982-5, 6,800 scientists left EC countries for the United States. In 1985, 9 percent of scientific and technical staff in American industry came from the EC. The reasons for this development are obvious; two-thirds of European scientists who presented plans for potentially successful projects received no financial support from Brussels because of the EC budget situation.

In the proposal for the SCIENCE program the EC Commission therefore asks the governments of member states to increase their efforts. [The Commission states that] the Community must provide the funds necessary to subsidize supranational cooperation among European scientists in modern research fields. The Commission already made a start in 1983 with the experimental introduction of a new program; this was followed by a program for the period 1985-88 with funding of 60 million ECU's. By the end of 1987, 3,000 EC scientists will be involved in supranational projects. The most outstanding projects include the construction of an optically controlled microcomputer, a project that will be conducted by an interdisciplinary, international research team led by Edinburgh University

The Commission's latest proposal foresees an increase of EC funds to subsidize scientists for a total of 167 million ECU's. In this way, the number of scientists receiving subsidies from Brussels should reach 7 to 8 thousand by 1992. The new SCIENCE program includes a whole range of measures such as scholarships, research funds, postgraduate courses, partnerships between different research centers, research commissions, and special travel incentives. EC subsidies should primarily benefit special interdisciplinary oriented subjects such as mathematics, physics, and chemistry. In this way, a concentrated cooperation network should be created in the long term in the Community that would include 5 percent of European scientists, as opposed to the previous level of 0.6 percent.

08701

EC Commission Approves 112 New BRITE Projects

3698m079 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 465, 14 Oct 87 pp 9-10

[Text] The EC Commission has selected 112 new projects within the framework of the European research program BRITE (Basic Research in Industrial Technologies for Europe). At the same time a positive balance was outlined for the first projects that started in 1985. For the second series, Brussels will make 105 million ECU's available from the Community budget.

The primary objective of BRITE is to open up the application of modern manufacturing processes and materials in conventional industries within the EC, in order to make them more competitive against low wage countries in Asia and Latin America. However, these projects are not intended for the development of products that are ready for the market; this remains a task of industry. The Community meets up to 50 percent of the project cost, while the remaining 50 percent is covered by the companies, universities, or research centers involved.

The successes of the first phase of BRITE include a fully automated system for the manufacture of clothing, a prototype of computer-controlled welding equipment for shipbuilding, and a new process for water filtering, which is going to be tested shortly in a purification plant near Paris.

In addition to individual results, according to the EC Commission, BRITE has made a general contribution to preparing European firms for cooperation beyond national borders or single branches. A basic BRITE rule requires that at least two partners from different EC countries must participate in each subsidized project. Out of 471 proposals received for the second BRITE series, for budget reasons the commission could only consider 112. [A total of] 473 organizations will participate in the new projects, 60 percent of which are industries, 25 percent research institutes, and 16 percent universities. More than 40 percent of the companies are small- and medium-sized firms (KMB), while in the first BRITE phase they constituted only 30 percent. The EC Commission will continue to encourage large companies to cooperate with KMB's and, for this reason, has given priority to projects with KMB participation.

The new projects include, for example, a prototype for a computer controlled knitwear factory and a painting system in which several layers of paint are applied simultaneously.

08617

TECHNOLOGY TRANSFER

FRG, Hungary Sign Scientific Cooperation Agreement

3698m074 Duesseldorf VDI NACHRICHTEN in German No 43, 23 Oct 87 p 15

[Article by Dagobert Gosch: "Scientific agreement signed. Hungary decides for German research. Usefulness for the FRG only moderate;" first paragraph is VDI-N introduction]

[Text] VDI-NACHRICHTEN, Hamburg, 23 November 1987—An FRG-Hungary scientific agreement was signed during Premier Karoly Grosz' visit to Bonn, in order to improve Hungary's scientific and technological standing and to intensify cooperation with the FRG.

Hungary owes the West a good $9 billion. Twenty years of economic experiments have driven the country to the brink [of diaster], and because of this painful experience Hungary's political and economic leadership has decided to make sweeping changes in state-guided research policy. The conviction is that the economy will never gain ground without modern production technology. Production cannot be renovated if it cannot rely on science. Therefore, the objective of the scientific agreement with Bonn is to accelerate the science and technology transfer toward Hungary, on the basis of measures aimed at increasing confidence.

Hungary's political leadership wants to jump several steps ahead at one go and rush at the "best of the best." That, at least, is the opinion of Guenter Boegl, Hungarian analyst at the Institute for Society and Science at Erlangen Nuernberg University.

Budapest wants to go full steam ahead in three key areas in the "scientific-technical field" in the current 5-year plan for 1986-90. Energy and raw materials consumption; electronics and microelectronics, as well as genetic engineering are considered to be key technologies worth innovating. Once research and, consequently, developing technologies have reached western standards, Hungary will have much to offer in world markets—at least, that is what planners hope. But a number of barriers between East and West still have to be removed, especially the COCOM provisions. These provisions "constitute a handicap," especially for research, says Dieter Mueller regretfully. In fact, urgently needed research results suffer unnecessary delays without technical equipment produced in the West. "The boys are good in theory. The only question is, what are they allowed to have access to," the electronics researcher continues.

Hungary's chances of success do not look too bad, considering the scientific fields chosen by Budapest. Together with Bulgaria and the GDR, the Hungarians occupy first place in east European computer manufacture. Hungary had to suffer painful environmental destruction when its national coal resources were extracted. This experience led to considerable environmental technology. Not without reason, Budapest has opted for the promising field of genetic engineering. Research [conducted by] domestic chemical and pharmaceutical industries has recently been accelerated by successes in enzyme and immuno-protein research.

A sober view should probably be taken of the purely scientific profit [to be gained by] the FRG from this scientific agreement. But then, the FRG economy already profits today from cooperative agreements between the systems.

08702

BIOTECHNOLOGY

Hungarian Officials on Further News on Biotechnology Problems

Lang on Function of Biotech Council

25020021 Budapest UJ IMPULZUS in Hungarian No 21, 17 Oct 87 pp 40-42

[Interview with Istvan Lang, first secretary of the Hungarian Academy of Sciences, by Anna Varkonyi: "It Won't Work Without Capital", pp 40-41.]

[Text] A number of areas are interested in biotechnology. But without coordinating them there will not be a developed bio industry in Hungary in the 1990's. The development of the bio industry is slow and capital intensive, but what we stint on now we will pay a great price for in the future.

It will soon be 3 years since the Biotechnology Council was formed at the initiative of the minister of industry. They asked Istvan Lang, first secretary of the Hungarian Academy of Sciences, to be chairman and he now answers our questions about how this body, consisting of outstanding experts, can aid the unfolding of the biotechnology economic development target program.

[Question] With what goal was the Biotech Council formed?

[Answer] It offers especially good opportunities for consultation by experts in three large areas—scientific research, technical development and practical work—in regard to industrial and agricultural themes alike. The OMFB [National Technical Development Committee] is coordinating the biotechnology research program; the Biotech Council tries to work out positions and prepare recommendations for practice, for production. Three years ago at the first session of the council we felt that in the present 5-year plan there was need for research and technical development preparation of a longer range national program for biotechnology, although even then it could be expected that sooner or later this theme would be included among the central economic development target programs. In this scientific and technical development preparation we are cooperating closely with the OMFB. The chief of the Protein and Biotechnology Office of the OMFB, U. Pal Kralovanszky, is a member of the council. We have begun to prepare a number of forward looking studies which may serve later as a basis for development of an economic development target program. We have already published joint studies by the Ministry of Industry, the OMFB and the Hungarian Academy of Sciences on the following themes: the status and future developmental possibilities of the microbiological industries, crop production and biotechnology, animal breeding and veterinary medicine. (UJ IMPULZUS, No 25, 1986, described the studies in abbreviated form.) On 1 October we debated a status report on the foodstuffs and pharmaceutical industries; scientific studies of the interdependencies between biotechnology and the machine industry and the chemical industry are in a preparatory stage.

[Question] Was there a research program with which you did not agree?

[Answer] Among the ministry level research guides of the Ministry of Industry the program titled "Long-Range Tasks of Biomass Production and Processing" evoked a conceptual debate. Together with the enterprise contributions this program was disposing of about 2 billion forints, and it embraced a rather broad sphere. The artificial fertilizer and crop protection materials necessary for producing the biomass affect the chemical industry, but certain areas of the agricultural machine industry also have an interest in it; technical development closely connected with biotechnology has an effect on fermentor technology and on fine separation processes in the chemical industry. After the half-time review our basic critical observation was that the program wanted to bring together too broad an area, and as we know he who reaches for much grasps little. We recommended narrowing the program and shifting the emphasis. We supported the ideas pertaining to development of fermentors and setting up experimental plants. The council debated separately the status of making bio briquettes. A fuel corresponding to medium coal quality can be produced by making briquettes out of agricultural wastes, but this is not competitive today because it does not get the same support as coal (only about 80 percent of that), and so today the farms have no interest in dealing with bio briquettes, although we are talking about an existing, large reserve. It is obvious that one should not and cannot contrast the bio briquette question to coal mining, for briquettes come to only 2-3 million tons compared to 25-26 million tons of coal, but it is worth considering as a supplementary source. I hope that the contradictions in this area will end in the future and that there will be favorable preference changes. In any case, support is a question of attitude and of material resources, and perhaps the latter is the more serious obstacle.

[Question] In what areas of biotechnology can one expect the quickest results?

[Answer] The foodstuffs and pharmaceutical industries are the most promising. Expanding variety and improving quality represent progress in the foodstuffs industry. In the pharmaceutical industry there are possibilities for producing a few new products or new types of old products. The third heir apparent is the enzyme manufacturing industry. Today we still cover our enzyme needs entirely from import. The virus immunization program in crop production and reproduction biology in animal breeding hold out possibilities, although they are of smaller proportion. The least spectacular area, but one the development of which is of elemental interest for all of us, is sewage purification. We still turn very little

attention to this, but what happens during sewage purification is also biotechnology, if not so showy as, for example, manufacturing insulin with the aid of genetic manipulation.

[Question] Agriculture, the foodstuffs industry therein (still handled unkindly), industry, the OMFB and the MTA [Hungarian Academy of Sciences] are all involved in biotechnology. Can the council help to concentrate the scattered forces?

[Answer] The members of the council are enthusiastic people who are doing social work because they believe in the cause. In the years ahead they may help much in forming a long-range industrial development policy in which the ratio of the bio industries will be greater than it has been. Of course this could be called structural change too, although I must say that we are not in a position to change structures overnight. The development of the bio industry is a slow, capital intensive process. So fundamental preparation, patience and diligence are important. I do not believe that a biotechnology main authority which would hold everything in one hand would represent a solution. It is true that many organizations are dealing with the question, but this is natural because the interested areas are different too. However, I am still not satisfied with the coordination. Further progress should be made here, and on this occasion I would like to emphasize the readiness of the Academy in this regard. Experts must be trained and every asset must be used to create the objective conditions, because we are constantly losing our positions in the international field. Our backwardness is substantially greater than it was 5 years ago. In the first years of the 1980's we felt a great impetus in ourselves, but soon this will be only a feeling and not a reality. The international field has accelerated greatly and will leave us behind if science and technical development are not given a privileged position, which of course involves not only rewards but also requirements. Without this there will not be a developed bio industry in Hungary in the 1990's. What we stint on this today we will pay a great price for in the future.

Progress, Needs of Godollo Biotech Center

[Interview with Dr Sandor Pongor, scientific deputy director of the Agricultural Biotechnology Research Center in Godollo, by Judit Gabor: "Elite Training in Godollo," p 41.]

[Text] Recruit ambitious young people interested in technology; teach them what they need to know; offer them opportunities; and if you are satisfied with one another after the years of study establish with them a promising undertaking based on biotechnology! In essence the Agricultural Biotechnology Research Center in Godollo was founded on the above criteria, as we learned from the scientific deputy director of the center, Dr Sandor Pongor.

[Question] Among other things you sought colleagues in the journal HETI VILAGGAZDASAG for your research program to be started in the middle of 1989, setting as a condition that up to then they must participate in a two and a half year training program. Why was this, did you need to experiment with a form of training not previously known here?

[Answer] Looking over the domestic status of biotechnology we found that although several universities included biotechnology subjects in their training program with few exceptions they did not succeed in providing instruction at the appropriate level. This is a branch of science requiring broad, profound knowledge and involving special methodological preparation and approach. Testing the methods requires significant quantities of chemicals coming from capitalist import and at present the universities cannot provide these out of their restricted foreign exchange allotments. Developing the way of looking at things requires a broad but not superficial approach, and this approach is still a shortage item here. Only the journal TUDOMANY makes this specialty accessible to the public. In my opinion we should write many similar textbooks to bridge over the contradictions between the "technological" and "scientific" way of thinking. That is why I considered it an especially fortunate idea when the BME [Budapest Technical University] and the ELTE [Lorand Eotvos Science University] started a biological engineering branch jointly. But the initiative has a weak point—the conditions for practical instruction in molecular biology have not yet developed.

[Question] In the course of their studies so far your students have participated in various types of training. How do they meet your professional expectations?

[Answer] We can measure the professional deficiencies of our students on the basis of university themes and personal interviews. During the two and a half years of training our candidates take a medium level language test and study English and hear lectures on microbiology, genetics and biochemistry among other things, but they must also acquire computer technology knowledge. Laboratory work forms the backbone of the training program; when organizing this we tried to see to it that our colleagues could work in laboratories accepted and certified at the international level. For example, our colleagues working in Szeged work in the laboratories of the Szeged Biology Center of the MTA [Hungarian Academy of Sciences] which represent the world level, surely, and in addition they can hear lectures at the Attila Jozsef Science University in Szeged. And so that the years spent far from their homes should not cause them to fall behind materially we repay their expenses—for subleasing, travel, language courses. During the training program the participants get a scholarship of 4,500-6,000 forints per month depending on the progress of their studies. At present we have almost 40 colleagues enrolled.

[Question] What happens if one of your candidates does not come up to your expectations in the meantime?

[Answer] When someone joins us we sign a six-month contract with him. When this expires his theme leader can recommend or reject further cooperation. If he is satisfied with him then he can continue his work on a later foreign study trip. This is made possible partly by a loan from the World Bank and partly by the theme leader making use of his international scientific contacts.

[Question] If the actual work begins in 1989 will the training stop then or will you continue the path started?

[Answer] After the run-in period the Center will have to resume its educational tasks. We would like to train experts in a post-graduate form according to a system similar to the present one. We think it would be an optimal solution if some agricultural operation, production system or state farm would send its young workers to us within the framework of an existing cooperation and we would return them as more highly qualified experts with a knowledge of the goal. At present our institute works on a budgetary basis but our goal is the practical use of knowledge. We must solve this in an outstandingly functioning system so that we can cooperate in the most effective way, primarily with agricultural firms. We hope that within a few years information will be provided not only by the researchers beginning now but also by senior researchers who have already met our requirements. They learned biotechnology "on their own" and in general did so abroad. From them we expect that they will be known in international scientific life, that their publications will be known around the world and that their research ideas will turn toward applications within our main guidelines.

Colloquium on Fermentation

[Unsigned note, p 42.]

[Text] On this occasion the meeting of the experts of our biological industry usually held every 3-4 years will be sponsored at the end of this month by the Hungarian Biochemistry Association and the Bio-Engineering Work Committee of the MTA. The organizers have also invited theoretical experts to the Eighth Fermentation Colloquium.

Simply because of the necessarily different viewpoints of theoretical and practical experts we can expect a lively professional debate about the domestic affairs of the fermentation industry, which is developing rapidly throughout the world. The materials of the program will appear in a publication and at the site, in Balatonszemes, the producers and vendors of biotechnology devices will provide product descriptions and displays.

The colloquium undertakes to survey three themes. One of these is the design, development, and operation of bioreactors and the development of control cycles, that is a debate of problems and recent achievements connected with the development of tools for biotechnological activity.

Another area to be discussed in detail is the production and improvement of microorganisms to be used in biotechnological processes. Economic leadership and our public opinion expect a great deal from the gene manipulation technique and its use.

They also want to make public the experiences attained in the design and development of biotechnological procedures. This last theme is organically linked to the preceding two and because of the swift development it is linked to the extraordinarily market sensitive practice. The goal is maximal utilization of the genetic potential of microbes capable of greater and newer output in ever more perfect reaction spaces (fermentors).

8984

COMPUTERS

Design of Hungarian SSP Circuitry

25020014b Budapest UJ IMPULZUS in Hungarian No 19, 19 Sep 87 p 48

[Article by Janos Kis: "Where We Still Have Possibilities (2); Cell Processors"]

[Excerpts] Intensive research on the development of cell processors is being conducted in our country. The problem is caused primarily by the lack of an integrated circuit manufacturing base, because the experimental circuits, which would be of a special design, cannot be made, or could be made only with great difficulty. Despite this one can use "catalog circuits" to build systems in which the correctness of the thinking can be checked.

A contribution to concrete realization was made by the diploma thesis of Jozsef Toth which formulates the theoretical foundations on which one must build an independent, Hungarian designed cell processor. A possibility for further development was given so the author continued his work in the Computer Sciences Faculty of the Attila Jozsef Science University, putting into practice the theoretical foundations already laid down. He prepared implementation plans for a practical, task oriented, programmable cell automat—an SSP circuit using the accepted abbreviation.

A cell processor carries out operations in a so-called cell field. This is nothing more than a network of programmable basic cells. The program to operate it must decide what tasks this network can solve at the moment. The philosophy for the entire model is characterized by a system of sub-processors placed in parallel and one after another.

In order to have an operable system the SSP circuits must be made into larger interdependent units, the so-called cell fields. In order to connect these together the circuit would have to have very many pins, which is not possible either physically or from the viewpoint of cost. So the individual units are connected by so-called edge exchange circuits.

The various cells are connected by jumping circuits of various types. This is a switching network which makes possible the temporary and programmable breaking up of proximity; that is, from the viewpoint of data traffic even cells distant in space can be neighbors. The writable-readable memory of the circuits stores the paths, which must be loaded with suitable information before running the program. The SSP which has now been designed in our country contains 63,536 cells divided into 16 subfields. A data vector processor of the customary design controls the connection of the SSP circuit with a traditional computer. This is possible because the input and output data of the cell field are vectors the elements of which must be given to or taken from the edge of the cell field in steps. The timing data and parameters of these are given to the processor in the form of traditional microprograms.

In developing the program languages and their compiler programs this requires a way of thinking fundamentally different from the traditional one.

[The article is accompanied by a figure providing a block diagram of an SSP circuit. A 36 bit control bus controls four sets of inputs and outputs, N, E, S and W for the four sides of the programmable switching network; the latter communicates with the 8 x 8 cell inside it via four shifting registers.]

8984

Hungary: Future for Cell Automats Seen

25020014a Budapest UJ IMPULZUS in Hungarian No 17, 21 Aug 87 p 46

[Article by Janos Kis: "Where We Still Have Possibilities (1); Cell Automats"]

[Excerpt] Very many identical circuit elements—transistors, diodes, capacitors—make up an integrated circuit, but these are still far from the ideal cell automat. This is a theoretical area of computer technology where domestic research surprises world public opinion with newer and newer achievements.

The time is coming when computer technology devices can hardly be developed further with traditional organization and technology. The operating speed of the processors cannot be accelerated further; there is need for development of newer, more easily accessible operational and background stores with greater storage capacity than at present. So it is logical for us to try to "steal" everything which has been proven in nature already. We must learn and model the operation of the human nervous system. Neumann has already outlined the path to be followed. In nature the several instructions are processed by simple systems consisting for the most part of two state switching elements. The key hides in the operating program controlling them, which makes it possible for many independent "processors" to perform with elements of operation sequences broken down into elementary units the necessary computing transformation processes not one after another as in traditional computers but rather at one time. This principle appears in the professional literature with the designation of a non-von-Neumann computer. Nice results have been achieved by the cell processor development project led by Tamas Legendi; its goal is the theoretical and practical development of a "neuprocessor" [as published, "neuroprocessor" may have been intended] simulating the operating principle of the nervous system. These cell processors consist of highly integrated, apparent, programmable cells. Programming the two-state cells involves the same problems as in the case of the first

computer in its time; one must find auxiliary programming languages and compiling programs. Domestic developmental shops have already prepared the prototype for a cell processor card containing 1,000 circuit capsules, the capsules containing 24 x 8 cells, but the fire at the MEV [Microelectronics Enterprise] greatly retarded practical realization. The technology for producing modern, highly integrated circuits makes it possible to develop circuit capsules consisting of multi-state cells which are easier to program. Plans have already been prepared for a small scale cell processor which significantly accelerates the operating speed of personal computers in a few types of task. But the developers are faced with a serious difficulty—they must combine the need for minimal structure with a property contrary to it. Cell processors require very many circuit elements, because the storing of programs and the execution of tasks take place within the cells. As the result of a compromise an opportunity now stands before us—Hungary could appear on the world market in time with a cell organized personal computer coprocessor which could be manufactured in large series.

Preparing a programming language and compiling programs for cell processors is also an entirely new task. As a result of great effort, the research group of Tamas Legendi has prepared the INTERCELLAS and CELLAS simulation languages. It is characteristic of the magnitude of the task that they contain nearly 100,000 source language, FORTRAN program lines! But these are not yet cell program languages. It is "only" that with their aid one can write mainframe programs which simulate the internal connections of the several cell processors and by testing the algorithms through them it becomes possible to check the theoretical thinking even before the processor is actually made.

Parallel with the development of cell processors there is research on algorithms with which these processors will eventually be programmable or on the basis of which the individual cells can be connected into a system on the integrated board of the processor. The theoretical results of this work include a proof that any synchronously operating algorithm containing operation performing elements, elementary or compound in their break points, which can be described with a guided graph can be programmed, or can be embedded in a cell field. The data paths also can be quite varied. It is already natural for the multi-processor machines of today to have 2-3 processors working in parallel or to have a task oriented coprocessor organization. (Let us think only of the video, sound and CPU processors of the AMIGA working in parallel, or of the mathematical coprocessors.) The current super computers work with processors of equal rank located in the apexes of the so-called "cosmic cube." Every element of a processor made up out of cell automats is a microprocessor and one can imagine the most varied data paths between them. In practical computer technology the finite element method is that for which the cell processors can be ideally used. Their mass spread would mean a great step forward in current CAD/CAM applications.

[A figure with the article shows a simplified block diagram of a cell processor. The host computer communicates with a peripheral control which communicates with a cell field control unit and with an input/output processor; data paths from the latter feed to the four sides of an 8 x 8 cell field.]

8984

LASERS, SENSORS, OPTICS

Romania: Official Interviewed on Laser Research

27020001 Bucharest CONTEMPORANUL in Romanian Nov 87 pp 8-9

[Interview with Lucian Pascu, director of the Institute for the Physics and Technology of Radiation Instruments]

[Text] Laser physics, currently undergoing full development both nationally and internationally, is one the most important fields of modern physics. At the confluence of many "traditional" directions and trends in modern physics and technology, laser physics and technology has retained, and lately has even broadened its interdisciplinary nature, as well as the many links and interactions which in recent years have formed the basis of all progress in this field.

About two weeks ago, the date of 20 October marked the 25th anniversary of the construction of the first Romanian laser. The major applications of lasers are found in materials processing, scientific research, printing technology, medicine, telecommunications, data processing, metrology, audio and video technology, and so on. It is interesting to note that a comparison between the development of lasers in their first 25 years and the development of computers during the same period, statistically shows that lasers have outdistanced computers in international sales.

The documents of the 13th Party Congress, the guidelines of Nicolae Ceausescu, and the program of measures formulated by the National Council for Science and Education under the direct leadership of academy member Elena Ceausescu, regarding scientific research and the implementation of new technologies, place the development of laser physics in a focal position.

The National Physics Center has recently held a national conference on "Achievements and Prospects in the Laser Field and Laser Applications in the National Economy," which was attended by approximately 400 specialists from ICEFIZ in various areas of the economy and of scientific activities. The more than 140 communications and 25 papers presented at the conference have shown the high standing of Romanian scientific research in this field, and the broad near future prospects that are open to industrial progress or to other areas of fundamental

and applied science associated with laser technology. This interview is devoted to a survey of Romanian laser physics research and its many applications.

Lasers in Competition With Computers

One of our first conversations was with Dr Mihai Lucian Pascu, director of the Institute for the Physics and Technology of Radiation Instruments, who began by sketching the outlines of the topic's extensive implications:

[Answer] Lasers and laser systems are major elements in the worldwide technical and scientific revolution, and consequently the objects of sustained activities conducted in our country to strongly support a two- fold labor productivity increase in national economy units by 1990, and to serve as important instruments in the development of modern unconventional technologies.

At our recent national conference, specialists from the institute and from applications areas, primarily industry, agriculture, and medicine, have broadly and clearly outlined ways and means to more rapidly implement laser technology in the national economy and in research. In particular, they analyzed the expansion of laser and laser equipment production on an industrial scale, as part of enterprise modernization and the introduction of complex products which will encompass great amounts of skill and knowledge. In this respect, better ties have been established between institute specialists and specialists in the national economy, forming multidisciplinary teams to solve important technical problems such as laser processing and treatment of materials, laser AMC, laser medical equipment, and so on.

A review of the development trends in laser physics and its associated fields throughout the world, shows that research efforts are currently aimed in two major directions. One is the study of lasers as sources of electromagnetic radiation with the well defined special properties of monochromaticity, directionality, coherence, and so on; and the other is the use of lasers as sources of radiation in a broad area ranging from multidisciplinary fundamental research to major industrial applications. Thus, lasers are currently being developed first of all to extend the spectral region in which they radiate, since they cover wavelengths from several tens of angstroms in the X-ray band, to tens of micrometers in the far infrared, practically reaching the wavelength of masers. Sustained work is carried out to consolidate and expand present results, and to obtain stimulated emission in the range of gamma nuclear radiation. At the same time, the aim is to expand the (continuous or step) tunability of laser radiation in all the mentioned spectrum ranges, by using various active laser media that exist in the solid, liquid, or gas state, including plasma. It is estimated that in principle, laser radiation can be obtained in any active medium as long as the necessary energy can be pumped under the appropriate experimental conditions.

[Question] According to our information, you are also seeking to obtain the highest possible energy or power as a basic characteristic of laser radiation, which implies the solution of difficult technical problems associated with materials that will withstand intense electromagnetic radiation.

[Answer] Precisely. In continuous wave lasers, beam power can reach hundreds of kilowatts in the laboratory and up to 10 kW in commercial lasers, while in pulsed lasers the maximum power is of the order of a terrawatt per pulse; pulsed lasers can already emit in the area of tens of megawatts per pulse, with a trend toward hundreds of megawatts. An important research direction is to perfect lasers, and primarily active laser media, which will assure the highest possible energy efficiency, meaning the highest possible ratio between the energy of the laser emission and the energy effectively introduced into the laser system.

A number of activities can currently still not be undertaken consistent with modern criteria of efficiency and quality, without using the means provided by complex laser installations; these are the processing of materials that are difficult to melt or are extremely hard, land or space communications, information storage and processing, some nondestructive control techniques, various photochemical processes and technologies, and many others, such as the implementation and control of complex physicochemical processes, the production of high purity materials with superior performance and quality, modern biological and medical research, the construction of automated and computerized machine-tools, new generations of computers, and so on. Laser applications are becoming diversified at a rapid rate in close correlation with the new types of lasers being developed, and cover an extensive number of key areas such as unconventional materials processing and treatment technologies (in general, the interaction of laser radiation with inert matter), medicine and biology (more generally, the interaction of laser radiation with living matter), information transmission, remote detection and alignment, dynamic holography, interferometry and image processing, environmental pollution control, isotopic separation and selective robotic photochemistry, computer technology, amusement and consumer goods, and so on. Laser applications in fundamental scientific research are surface physics, hot plasma physics and technology, laser optics and spectroscopy, and so on, all of them associated with particular types of lasers. *In practice, for each type of laser (and there are several tens of types) long lists of utilization can be drawn in research, industry, as well as social life.*

[Question] In Romania, the laser field has a 25-year tradition, with many of the major laser types having been developed during this time. What are IFTAR's plans for the present and the future?

[Answer] Recent activities have been aimed at diversifying the types of lasers, such as He-Ne, CO_2 (pulsed and continuous wave), ionized argon, nitrogen, dye, solid

state (pulsed and continuous wave), semiconductor, and so on, while improving the operating parameters of existing lasers and expanding the number of their applications in the most diverse fields. We have built new types of lasers with superior features, whose major applications are in materials processing, environmental pollution control, medicine and biology, plasma research, the preparation of ultrapure substances by means of photochemical processes, image processing, as well as industrial interferometry and holography. Helium-neon laser alignment systems that we have built are frequently used in industry, construction, and agriculture. The most recent worldwide surveys show that heat processing of materials is the leading major application of lasers. In this new and growing area, the CO_2 laser cutting installation cooperatively built by IFTAR, ICTCM, and IPA, makes it possible to cut steel plates as thick as 4-5 mm in the machine construction industry. Other installations that we have built are the Solar F3, designed to cut silicon wafers in the electronic industry, as well as Neodim 15 and Hercules 25. We have currently built a high power CO_2 pulsed laser that operates at a very high pulse repetition rate, thus combining the advantages of pulsed lasers with those of continuous wave ones, and that can supply a peak power of the order of tens of megawatts, and an average power of 500 watts. Such lasers have been built only in the United States and the USSR. In medical laser applications, we have built two types of CO_2 laser scalpels, Bilas-10 for microsurgery and Bilas-30 for general surgery, three type of photocoagulators used in ophthalmology, and a helium-neon laser biostimulator used to treat rheumatic ailments and in acupuncture. Their advantages over conventional equipment derive from the specific interaction process between laser radiation and live matter, a process which induces energetic and structural changes in tissues, and that can have different actions on pathological structures without causing any trauma.

Our programs for this five-year plan and until the year 2000 include further significant objectives for laser research. It is important to point out that lasers must be used not only where their application is obvious, but also where other devices or instruments are not very efficient.

[Missing original text] efficiency and quality, without having recourse to the facilities offered by complex laser installations. As an example, during the 1984-1987 period, materials heat processing is the leading utilization among the major applications of lasers throughout the world. The most widely used laser systems are carbon dioxide lasers with powers of several watts to as much as 10 kW, and neodymium lasers with average powers of up to several hundred watts. Romania currently produces carbon dioxide lasers similar to those found throughout the world for industrial applications in the specific operations that we have already mentioned; for instance, a several-fold increase in surface hardness can be obtained by these means. At present and for the immediate future, the 1.2 kW continuous wave carbon dioxide laser is the one with the greatest demand. Another system we have built in collaboration with researchers at ICTCM and IPA, whom we have already mentioned, is a computerized numerical control system for milling complex shapes.

[Question] To what extent are these installations competitive on the world market or are considered as priorities?

[Answer] Laser nitriding of steel and titanium, a new and highly efficient technology to harden metals and produce materials for the electronic industry, is a high priority process throughout the world; neodymium-doped YAG, pulsed and continuous wave glass lasers, offer performances comparable to the best in the world, being used for drilling, microdrilling, precision trimming, heat processing, and engraving. The immediate plans are to introduce new laser systems with higher performances, in line with the evolution of this field throughout the world.

[Question] Laser measurement and control instrumentation (AMC) has become an active feature of modern industry and agriculture, due to the high precision that can be obtained in non-contact measurements. What is being done in this specialized field?

[Answer] With their modern optoelectronic devices and microcomputers, laser AMC is widely used for alignment, leveling, distance measurements (10 kilometers with a precision of approximately 1 cm, displacement (60 meters with a precision of a tenth of a micron), speed, deformation, and so on. These instruments use primarily lasers of low power but of highly stable frequency. In Romania, we are building alignment equipment for construction and land improvement. Similarly, the He-Ne lasers we fabricate in various models have competitive specifications.

The research and technical development of laser AMC in our country responds both to the demands of the national economy (well drilling and coal mines, irrigation and drainage channels, industrial alignment, accurate measurement in precision mechanics and machine-tools, semiconductor wafers and optical fibers, nondestructive measurements, and so on), and to worldwide trends. Many systems are combined with microcomputers to automate and use the full potential of laser beam measurement. The use of laser sensors and of artificial vision systems with coherent illumination (laser) for "intelligent" robots on automated manufacturing lines is a certainty for next decade's production.

[Question] Another leading research field that is rapidly developing throughout the world, is the use of lasers in chemistry.

[Answer] Laser production of sinterable powders is a most current and essential process for obtaining new, modern materials with special properties. We have already produced substances with laser radiation and developed methods and installations for production line irradiation, one of

these being a worldwide priority. In collaboration with specialists from the Dudesti Chemical Enterprise, we are conducting research in preparing new substances and developing the corresponding technical processes.

Research on substance separation and isotope enrichment based on selective heterogeneous processes induced by lasers in capillaries and porous media also represents a worldwide priority, being the result of collaborations with Soviet researchers at the Moscow General Physics Institute, led by the Nobelist for the discovery of the laser, Alexandr Mihailovici Prohorov. This research uses a wide range of lasers which we have built, among which the lasers frequency-stabilized with carbon dioxide and helium-neon are notable for their competitive performance.

[Question] Laser medical instrumentation for therapy and surgery is the object of a complex research and production program which is being carried out with the cooperation of medical specialists. Let us then examine the use of lasers in medicine.

[Answer] Ever since they appeared on the scene, lasers have stood out for their precise manipulation and efficient *laser-tissue radiation* interaction. For this purposes, we have developed lasers than emit from the ultraviolet to the infrared, either in continuous wave or with short but high-energy pulses. Together with the development of laser instrumentation, we have conducted a number of clinical studies regarding its application to various medical specialties such as ophthalmology, gastroenterology, neurosurgery, otorhinolaryngology, urology, gynecology, dermatology, and so on. Thanks to the development of optical fibers or of various optomechanical devices, lasers have been adapted to live tissue cutting, tissue vaporization (especially in tumor areas), tissue ablation (blood vessels), eye correction, hemorrhagia treatment, cardiologic vessel replacement, and so on. Due to the use of medical laser instrumentation, many medical procedures can be performed as ambulatory cases either with local anesthesia or without anesthetics. Another essential factor is the shorter recovery period of patients following intervention.

In terms of laser medical instrumentation built in Romania, we can mention the Bilas-10 carbon dioxide laser scalpel; the Dyclas ophthalmologic pulsed dye-laser device, combined with a biomicroscope, and used to treat retina ailments; the YAG:Nd laser ophthalmoscope and biomicroscope; the He-Ne laser biostimulator; the ionized argon laser photocoagulator; and the Bilas-30 carbon dioxide laser scalpel. Our present program includes the production of new laser medical equipment, using a broad range of improved lasers and aimed at expanding the range of medical applications consistent with the most modern achievements and trends reported throughout the world.

[Question] Continued work on these objectives implies the development of new types of lasers, and general diversification and performance improvements in existing types.

[Answer] Unquestionably so. In CO_2 lasers for instance, we expect to obtain high continuous wave powers and pulsed energies about ten times higher than present ones by the year 2000. In tunable continuous wave lasers with solid and liquid active media, we will obtain tunability over the entire visible, IR, and near-UV spectrum, by means of non-linear effects, parametric generation, and generation in broad-band emission active media. Similarly, we will obtain "white light" lasers with discrete multiple emission lines located in the visible band.

To extend the laser emission field, we will work with new type of improved and specialized lasers which will allow us to introduce new applications of international interest, such as dynamic lithography and holography for microelectronics. World class semiconductor lasers will be developed for communication applications, computer technology, and scientific applications. We will work and develop ultrafast (pico- and femtosecond) pulsed emissions using solid and dye lasers, methods to detect these pulses, and specific applications (ultrafast spectroscopy, ultrafast electronics, semiconductor materials testing). Metal vapor lasers will be developed for the most diverse applications. Similarly, in the coming years we will expand research to generally improve the performance of all the lasers developed until now.

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MICROELECTRONICS

Hungary: Special Purpose IC for Control of Stepping Motors

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[Article by Ferenc Fekete and Piroska Szentpeteri: "A Special Purpose Integrated Circuit for Control of Stepping Motors"]

[Excerpt] A Special Purpose Circuit to Drive Stepping Motors

A special purpose integrated circuit to drive stepping motors was developed at the Microelectronics Research Institute of the KFKI [Central Physics Research Institute]; it is suitable for producing control signals for two stepping motors simultaneously, these can be two or four phase stepping motors of any type or manufacture. The circuit contains all the digital elements of the control circuits for the stepping motors and it can be fitted easily into the control systems described in the previous section. The broad range of services of the special purpose circuit makes possible complete accomodation to the needs of users, from the simplest controls to the microstep drive mode. We will summarize below the most important technical possibilities offered by the circuit.

The circuit offers a possibility for either manual (OFF LINE) or computerized (ON LINE) control. With the aid of the ON/OFF input the operating mode can be set from outside—even with a computer.

There are two direction selection inputs for both motors (FW and BW or R and L). In the OFF LINE mode these can be operated by switches, push buttons and joysticks. In this mode the stepping speed is determined by an internal oscillator the frequency of which can be regulated by an external RC member with infinite variations in a broad range (0.1 Hz to 50 kHz). In the ON LINE mode a computer provides the stepping pulses through the appropriate direction selection inputs.

The circuit makes possible the counting of steps taken, in the case of both motors, separately (COUNT and DIR outputs). So it is possible to restore the motors to a given base state.

Protection of the motors can be taken care of with final position switches, separate by direction; the VWF, VBW, VR and VL inputs serve this purpose. If we want to step some motor further in a direction in which it has already reached the final position then the control disables the stepping. In the case of a final position the circuit gives a feedback signal (the EL outputs).

Stepping can be disabled at any time from outside with the aid of the EN input. When switching on the power the so-called switch-on reset sees to it that stepping begins from a well defined state.

It is characteristic of the versatility of the circuit that it offers a possibility for three types of drive modes for four phase motors in addition to two phase motors. In addition to the usual stairstep and normal drive it is also suitable for microstep control, which increases the resolution of the motors eight times. The drive modes are selected with the V_1 and V_2 and it will work with the drive mode selected.

Structure of the Special Purpose Circuit

The special purpose integrated circuit is made with metal gate CMOS technology on an HT001 base circuit from the Communications Engineering Cooperative. It requires unipolar drive, power can be selected freely between plus 5 V and plus 12 V. The switching itself consists of three chief parts: the input control circuit, counters, and an output decoding network. The input control circuit processes the input signals which determine the conditions for operation; the motors are stepped at the rate of operation of the counters; finally the output decoding network produces from the output signals of the counters the phase authorization signals and the signals determining the excitation for the motors. The input control unit is common for the two motors but each has a separate counter and output decoding network. Let us follow the operation of the several units on the basis of Figure 18.

The Input Control Circuit

The input control circuit produces the signals needed to operate the counters according to the various input states:

a. U/D determines the direction of counting. If U/D=0 the counters count upward; if U/D=1 they count downward;

b. CK is the clock signal for the counters;

c. ENG is the signal enabling counting. If ENG=0 the operation of the counters is authorized; if ENG=1 it is forbidden;

d. RESET is a nulling signal; a logical 0 level appearing on the RESET line sets the counters to the base state.

Naturally the ENG and RESET signals of the two counters are common, but their U/D and C/J signals are different.

The stage producing the RESET signal has a dual function. If a timing RC member is connected to the external RES input of the circuit then when the power is turned on the unit sends a pulse—of a length determined by the RC member—to the RESET inputs of the counters (switch-on reset). At the same time—primarily to facilitate testing of the circuit—we can also null the counters at any time with a logical 0 level connected directly to the RES input.

The direction of counting is determined by the direction selecting inputs of the circuit. In the base state the direction selection inputs are at the logical 1 level; the stepping of one motor is controlled by the FW and BW inputs and that of the other motor is controlled by the R and L inputs. With a logical 0 level sent to the FW and/or R inputs we can indicate the movement forward of the appropriate motor and we can indicate movement backward by sending a logical 0 level to the BW and/or L inputs. (Naturally the FW and BW or the R and L are never at the 0 level.) A 0 level connected to the FW and/or R inputs tips the U/D input of the counter belonging to the corresponding motor to the logical 0 level; a 0 level connected to the BW and/or L inputs tips it to the logical 1 level (counting upward or downward).

The input control unit produces the clock signal of the counters in two ways depending on the state of the ON/OFF input of the circuit. The logical 0 state of the ON/OFF input indicates the ON LINE operating mode of the circuit. In this case the circuit expects to get the stepping pulses from a computer connected to the system, and these go directly to the CK clock signal input of the appropriate counter through the direction selecting inputs. If the ON/OFF input gets a logical 1 level then the circuit works in the OFF LINE mode. In this case the direction selection inputs really indicate the direction of stepping and the stepping takes place at the rate of the output signal of an internal oscillator. The input control unit takes care of starting the oscillator; if a logical 0 level

goes to some direction selection input then the output signal of the oscillator goes to the CK clock signal input of the counter belonging to the corresponding motor.

The frequency of the internal START/STOP oscillator of the circuit can be varied over a broad range with the aid of an external RC member which can be connected to the OR and ORC inputs. If the precision requires it one can also connect a quartz oscillator to the circuit from the outside. The output signal of the oscillator is at the logical 0 level until, with a logical 1 state of the ON/OFF input (manual operation mode), a 0 level reaches some direction selecting input (stepping some motor in some direction). Then the output of the oscillator begins to oscillate in accordance with the timing, but it first reaches the logical 1 level after the passage of only half a clock signal period. This guarantees, without any other customary amendment, freedom from bounce at the direction selecting inputs.

The state of the end position inputs of the circuit and of the EN authorizing input determine the authorization or disabling of counting. A logical 0 level connected to the EN authorizing input results in a 1 level at the ENG inputs of the counters, so the counting is immediately disabled. Counting is also disabled if we try to move any motor in a direction in which it has already reached the end position. This is indicated by a logical 1 state of an end position indicating input (VFW, VBW, VR, VL) belonging to the corresponding direction.

The input control circuit also has six outputs which indicate to the external world the most important factors connected with the state of the system. The CK and U/D signals of the counters (the COUNT and DIR outputs) are led out so it is possible to follow the steps taken and step back to some determined state. Finally, one output each (EL) serve to indicate the end positions of the motors.

The Counters

The counters are five bit synchronous up/down counters with authorization and asynchronous erasing. The U/D input determines the direction of counting. A logical 1 level connected to the ENG authorizing input disables the clock signal of the several stores. The RESET inputs of the stores are active at the logical 0 level, as a result all counter outputs go to the logical 0 level and states corresponding to this appear at the phase authorizing and excitation determining outputs of the circuit.

The Output Decoding Network

The output decoding network has two stages. In the first step a combination network produces from the output states of the counters the phase authorizing signals belonging to all control modes and, for the case of the four phase microstep mode, the signals determining the excitation belonging to the several phases. The second stage selects from these those which belong to the designated drive mode and sends them to the outputs of the circuit.

The circuit is suitable for producing phase authorization and excitation signals for four different drive modes. We can designate the drive mode with the aid of the V_1 and V_2 drive mode selecting inputs:

a. $V_1=V_2=0$ is the stairstep drive mode for four phase motors;

b. $V_1=1$ and $V_2=0$ is the normal drive mode for four phase motors;

c. $V_1=0$ and $V_2=1$ is the drive mode for two phase motors; and

d. $V_1=V_2=1$ is the microstep drive mode for four phase motors.

The stairstep and normal drive modes for four cycle motors require four phase authorizing signals (F1-F4). In the case of the microstep drive mode there is also a need for outputs determining the G1-G4 excitation, which designates the excitation state of the several coils for microsteps within individual phases. (The G1-G4 signals—already outside the circuit—go to a DA converter which produces the real excitations from them.) Two phase motors use only the F1 and F2 phase authorizing outputs.

Possibilities Offered by the Special Purpose Circuit

Naturally the circuit has all the advantages of the given technology—small space requirement, small consumption, etc. An entire circuit to control two motors can be placed in one 40 lead capsule. If it is necessary to drive only one motor then it is also possible to place the circuit in a 24 lead capsule, using only the leads needed for one motor. The circuit has special significance in microstep applications where the relatively complex control network can be simplified to a great degree. A simple DA converter can be connected to the G1-G4 outputs determining excitation; it produces the real excitation of the coils so in addition one needs only final stages with sufficient driving ability. Similarly, use of the circuit also makes the control and drive units of simpler drives simpler and more reliable.

In the near future the Communications Engineering Cooperative, in cooperation with REMIX, plans to come out with a hybrid integrated circuit which will contain all the control and drive units for a microstep drive, and the basic element of this will be this special purpose circuit.

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